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Vol. 78 JANUARY 1938 No. 1

THE FIFTY-FIRST CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The distinguishing feature of the 1937 convention, held in Washington, D. C., from November 14 to 17, was the special anniversary program. This program, jointly sponsored and formulated by the association and the Federal Department of Agriculture, centered around three major congressional enactments. These were, in chronological order, the act of May 15, 1862, establishing the Department; the original Morrill Act of July 2, 1862, creating the land-grant institutions; and the Hatch Act of March 2, 1887, providing Federal aid for State experiment stations.

The anniversaries thereby resulting were effectively commemorated in exercises which recalled the history and development of the land-grant institutions and the Department and paid special tribute to three presidents of the United States who had meant much to agriculture and education—George Washington, Thomas Jefferson, and Abraham Lincoln. At a pilgrimage to Mount Vernon a wreath was laid at the tomb of Washington, and commemorative exercises ensued at which the eulogiums of the association and the Department, expressed by the president and the Assistant Secretary of Agriculture, respectively, were followed by an address on behalf of the Nation, read by Secretary Henry A. Wallace for President Franklin D. Roosevelt, who was prevented by illness from a contemplated attendance in person. This address emphasized Washington's interest in agriculture and his many contributions to an improved farm practice, seeking to gain from his attitude an insight into policies appropriate under existing conditions. Jefferson was honored in a similar pilgrimage to Monticello. Here President J. A. Burruss of Virginia portrayed Jefferson as the prophet of democracy in education and research as subsequently exemplified in the land-grant institutions, and Secretary Wallace as the speaker of the day declared that "it was Jefferson, more than any man of his time, who foresaw the fruitfulness of the application of science to agriculture [and] the need

of a democratized education." A wreath-laying ceremony at the Lincoln Memorial, participated in by representatives of the association, the Department, and the national farm organizations, was supplemented by an address before the convention by Under Secretary of Agriculture Milburn Lincoln Wilson on Lincoln, signer of the acts of 1862.

Another special event was the pioneers' program on the evening preceding the convention, at which over 200 staff members of over 35 years' service were guests of honor. Dean J. L. Hills of Vermont presided, and reminiscent and appreciative addresses were made by him and by Eugene Davenport, dean emeritus of the College of Agriculture and director of the agricultural experiment station of the University of Illinois, whose topic was Serving Agriculture Nationally; Bradford Knapp, president of the Texas Technological College, who presented a paper entitled Tribute to the Men of Agriculture; Dr. A. F. Woods, director of the graduate school of the U. S. Department of Agriculture, who dealt with Pioneering in the Land-Grant Colleges and in the U. S. Department of Agriculture; and Dr. J. R. Mohler, Chief of the Bureau of Animal Industry of the Department, who discussed Scientific Pioneering in the Livestock Industry.

The general sessions were opened with a presidential address looking to both the past and the future by President Alfred Atkinson of Arizona. Tributes followed on the personality and services of Senator Justin S. Morrill of Vermont by Dean Hills and by one of his own kinsmen, Mr. Elmer E. Morrill of Fulton, New York. A similar appraisal was subsequently presented for Jonathan Turner by Dean H. W. Mumford of Illinois, for Thomas G. Clemson by President E. W. Sikes of South Carolina, and for Col. William H. Hatch by Dean F. B. Mumford of Missouri.

Still further opportunity for retrospect was afforded in the single joint session of the section of agriculture. Here Dean Davenport discussed the early days in An Adventure in Education, former Dean and Director H. J. Patterson of Maryland Trends in Agricultural Research, and Dean Hills Looking Backward and Forward. There was also much of reminiscence at the first of the three sessions of the subsection of experiment station work, which dealt entirely with the Hatch Act. The 50 years of experience were reviewed by Director S. B. Doten of Nevada; Director S. W. Fletcher of Pennsylvania presented an epitome of the major research achievements; and Mr. R. W. Trullinger of the Office of Experiment Stations contributed an interpretation of the policies and procedure involved.

Advantage was also taken of the occasion by Epsilon Sigma Phi, national honorary extension fraternity, to dedicate the Wilson and

Knapp Memorial Arches joining the Administration and South Buildings of the Department. The dedication address, mainly descriptive of the work and influence of former Secretary James Wilson and Dr. Seaman A. Knapp, was given by Hon. A. F. Lever, intimately associated with the passage of the Smith-Lever Extension Act of 1914. At the close of this address, memorial tablets erected by the fraternity were unveiled.

Still another phase of the celebration took the novel form of a Rural Arts Exhibition in the patio of the Department's administration building. This exhibit, conforming precisely to its catalog definition of art as simply "doing well something that needs to be done," and in charge of Mr. Allan Eaton of the Russell Sage Foundation, was a unique collection of some of the best handiwork of country craftsmen, generally utilizing native materials.

The injection of this comprehensive anniversary observance inevitably complicated and extended the convention program, the Monticello excursion alone occupying an entire day. Skillful planning and adjustment, however, resulted in surprisingly little interference with the normal routine. The preconvention evening session and the utilization of the afternoon of the closing day and of the midday hours on others were the principal innovations. Interest in the prolonged programs was well-sustained among the approximately 500 delegates and visitors in attendance, and active discussion was the rule to the extent that time was available.

A curtailment of the number of general sessions restricted the opportunity for speakers from outside the association's membership, but the Secretary of Agriculture and the president of the American Home Economics Association were among the participants. Other representatives of the Department from the Office of the Secretary, the Office of Experiment Stations, the Office of Cooperative Extension Work, the Agricultural Adjustment Administration, the Soil Conservation Service, the Farm Security Administration, and the Bureau of Agricultural Economics, as well as speakers from the Office of Education of the Interior Department and the American Council on Education, appeared elsewhere on the program.

The ground covered in the section programs was nearly as wide in range as usual. The section on home economics dealt with the outlook for that subject in the land-grant institutions; the interrelations, problems, and opportunities of home economics extension; research in home economics; and the relation of home economics to progressive developments in the field of education. In engineering, the comparative cost of engineering education in the land-grant and other institutions, opportunities for adjustment through research, and the engineering experiment station as a vehicle for graduate

education were considered. The subsection on resident teaching took up individualized instruction in agriculture, curriculum adjustments to meet changing conditions, professional training for extension workers, teacher training, and student placement. The extension subsection considered professional improvement and retirement plans for extension workers; the 1938 program in agricultural adjustment, soil conservation, farm security, and vocational education; and agricultural program planning.

Interstate cooperation in research in agriculture and home economics, the opportunities for research in farm woodlands, and the possibilities of cooperative preparation of reviews and other summaries of available information on agricultural problems were the major themes before the experiment station subsection. Following the custom of recent years, it is planned to discuss these matters in greater detail in the February issue of the *Record*.

For the first time in the association's history, the presidency was bestowed upon an extension director—C. W. Creel of Nevada. President J. A. Burruss of Virginia was elected vice president, and Dean and Director T. P. Cooper of Kentucky was reelected secretary-treasurer. In accordance with constitutional changes, the executive committee was enlarged from five to eight members, with Dean O. M. Leland of Minnesota and President J. J. Tigert of Florida designated for 1-year terms; Presidents C. E. Friley of Iowa and R. G. Bressler of Rhode Island for 2-year terms; President C. A. Lory of Colorado and Dean and Director F. B. Mumford of Missouri for 3-year terms; and President T. O. Walton of Texas and Dean and Director C. E. Ladd of Cornell University for 4-year terms. President Walton was elected chairman of the executive committee vice former Provost A. R. Mann of Cornell, now Vice President of the General Education Board. In recognition of their services to the association, Dr. Mann and Dr. R. A. Pearson, chairman from 1919 to 1935, were elected to life memberships in the executive body.

As an assembly for the discussion of current problems, the 1937 convention was on the whole a representative gathering—forward-looking, well-informed as to conditions and needs, fertile of suggestions, and cooperative in spirit. In addition, however, it will particularly be remembered for its program of retrospection. Its exercises of commemoration brought together many of the rapidly dwindling company of pioneers and placed on record impressively and effectively many matters of early history on which later generations cannot be too well-informed. Broadly conceived and ably executed, the anniversary observance reflected much credit on all its participants and rendered an important and lasting service to the cause which it honored.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The biochemistry of cellulose, the polyuronides, lignin, &c., A. G. NORMAN (*Oxford, Eng.: Clarendon Press, 1937, pp. [IX]+232, figs. 14*).—The author states that "the present position in this field has been examined critically, but the conclusions in some cases represent [his] personal opinions and philosophy and have not necessarily been previously published. In some chapters more points have been raised than answered. Some of the opinions expressed will no doubt later be proved to be incorrect, for if there is one certainty it is that dogmatic statements are most unwise and insecure. . . .

"The original intention was to deal only with the plant cell-wall substances, but in preparation it seemed desirable also to include chemically related substances, particularly those of a polyuronide nature. An account has therefore been given of plant gums, seed mucilages, and gelatinous carbohydrates from marine algae and bacteria, the study of which has assisted in the investigation of the polyuronides of the cell wall." Emphasis is placed upon the chemical constitution and the biological functions and decompositions of the various plant and microbial substances dealt with.

The monograph is made up of a foreword by E. J. Russell; chapters on cellulose, polyuronide hemicelluloses, pentosans, hexosans, and hexopentosans, pectin, gums, mucilages, and gel-forming substances, lignin, metabolism of plant cell-wall constituents, and microbial polysaccharides; an appendix dealing with uronic acids and pentoses; an author index; and a subject index.

[Wheat investigations by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 50, 51, 52, 53*).—This report includes chemical factors which influence the quality of wheat and flour, by E. B. Working; tempering factors affecting the quantity and quality of wheat flour, by R. O. Pence, J. E. Anderson, and C. O. Swanson; and factors which influence the colloidal properties of dough, by R. J. Clark.

The destruction of organic matter in the preliminary treatment of soils for mechanical analysis, A. N. PURI and A. SARUP (*Soil Sci., 44 (1937), No. 1, pp. 87–89*).—The authors compared three methods in a series of experiments carried out at the Irrigation Research Institute, Lahore, India. The nine soils used in the comparison were all selected for high humus content in order to subject the oxidation methods to a severe test. Humic substances remaining after treatment were determined by a colorimetric method, by titration with ferrous sulfate of the chromium trioxide remaining after oxidation with the last-named reagent, and by ignition. The third of these methods of determining soil organic matter is "an extremely unreliable method. It was included in this study, however, because many workers take the ignited weight of the various fractions separated in the mechanical analysis, and a comparative statement as to how the ignited weights are likely to be affected would be of interest."

From the data presented it is concluded that "the potassium permanganate

method is the most efficacious in the destruction of organic matter, next comes oxidation with sodium hypobromite. Hydrogen peroxide treatment is the least effective."

The ultracentrifugal purification and study of macromolecular proteins, R. W. G. Wyckoff (*Science, 86 (1937), No. 2222, pp. 92–95*).—This is an analytical and critical review of recent work by the author and others with the newly developed air-driven centrifuges. By their use, speeds sufficiently high are attained to actually sediment out the larger protein molecules so that already a number of the less stable proteins, such as those of the viruses of animal and plant diseases, have been obtained in purified form. A great advantage of the method lies in the ease with which large volumes of liquid can be centrifuged. A means is also provided of characterizing these unstable virus proteins and of determining the degree of their purity and the extent of their concentration at each step in their isolation. Many protein denaturations could undoubtedly be followed quantitatively and recorded photographically by these methods. Exploratory runs with bacterial extracts and undiseased tissues indicate that many other new and biologically important substances can be prepared and studied with the ultracentrifuge, in addition to the valuable data attainable relative to the nature of the disease-producing viruses. A new field of research is thus opened up into the mechanism and control of disease by the possibility of treating its cause as a pure chemical compound, and a new experimental approach to the bridging of the gap between the "dead" simpler protein molecules and the unquestionably living smaller bacteria, i. e., to attaching a more precise meaning to the terms "dead" and "alive."

A micromethod for quantitative determination of growth-promoting substances of group A [trans. title], P. B. Jensen (*Planta, Arch. Wiss. Bot., 26 (1937), No. 4, pp. 584–594, figs. 4*).—By the method presented the plant material under test is extracted three times with chloroform and HCl or with ether and acetic acid. After evaporation of the extracting agent the residue is dissolved in ether and, by an apparatus described and illustrated, is transferred to an agar plate. The latter is weighed, and its growth-substance content is determined by means of oats.

A comparison of some methods for the extraction of vitamin B_1 from international standard acid clay, W. L. Sampson and J. C. Keresztesy (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 1, pp. 30–32*).—The following methods were compared: The Williams method using quinine sulfate (E. S. R., 73, p. 437), the baryta method of Kinnersley and Peters (E. S. R., 77, p. 279), and the alkaline methyl alcohol method of Smith (E. S. R., 76, p. 743). The extracts obtained, together with the untreated acid clay and crystalline vitamin B_1, were administered to polyneuritic rats, and the Ammerman and Waterman (E. S. R., 76, p. 423) modification of the Smith curative procedure was followed.

The curative dose of the extracts prepared by the technics described by Kinnersley and Peters and by Smith was 20 mg and corresponded to that of the untreated international standard, while 10 mg was the curative dose for the extract prepared by the Williams method. Thus it is evident that quinine sulfate liberates from the acid clay approximately twice as much vitamin as is extracted by the other procedures. The potency of crystalline vitamin B_1 hydrochloride, based upon these findings, is approximated at 400 or 200 international units per milligram, depending upon whether the untreated international standard clay or its quinine sulfate extract is used for comparison. The fact that the larger figure falls generally within the range reported by other investigators using a curative technic, while the lower figure closely agrees with the findings obtained by the growth method of assay may indicate that "only 50 percent of

the vitamin present in the standard adsorbate product is available to the severely depleted polyneuritic rats, whereas the total vitamin effect is obtained on the less severely depleted animals used in a growth test." It would seem that any estimation of vitamin activity in terms of the present international units must be weighed in terms of the method of assay employed, and before comparing it should be determined that the vitamin present in both standard and test substances is available to the animal to the same extent.

The effect of metaphosphoric acid and some other inorganic acids on the catalytic oxidation of ascorbic acid, C. M. LYMAN, M. O. SCHULTZE, and C. G. KING (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 757–764, figs. 4*).—Observations are made on a series of ascorbic acid oxidation experiments carried out in the respirometer, using metaphosphoric acid to inhibit atmospheric oxidation. The protective action of metaphosphoric acid is demonstrated by a series of tests in which comparative observations were made on other inorganic acids.

The rate of oxidation of ascorbic acid in the presence of metaphosphoric acid depends upon a lowering of the pH of the solution and a decrease in the amount of copper present. The inhibitory effect is due to the action of metaphosphoric acid on the copper and not on the ascorbic acid. In buffer solutions near a pH 7 metaphosphoric acid is of little value as a stabilizer. In acid solutions containing the same amount of copper the rate of oxidation of ascorbic acid depends upon the H-ion concentration in the presence of sulfuric and metaphosphoric acids and is also accelerated by the anion in hydrochloric and hydrobromic acid solutions. In the presence of copper the atmospheric oxidation of ascorbic acid causes the formation of hydrogen peroxide and in solutions of pH $>$4.5 the evolution of carbon dioxide.

Comparative titrimetric and colorimetric ascorbic acid (vitamin C) determinations [trans. title], K. WACHHOLDER and H. H. PODESTÀ (*Hoppe-Seyler's Ztschr. Physiol. Chem., 239 (1936), No. 3, pp. 149–161*).—Various methods which have been proposed for the determination of ascorbic acid in urine and animal tissues have been compared both on human urine and on various organs of the rabbit and cat. The conclusion is drawn that at the present time there is no method which can be recommended without qualification as the best for all purposes. The methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746) and the colorimetric method of Medes with Folin's reagent (E. S. R., 75, p. 744) are thought to give the lowest and, therefore, the most specific values. For urine the methylene blue method is considered the most satisfactory. The determination with Bezssonoff's reagent as standardized by Rohmer et al. (E. S. R., 72, p. 283), the colorimetric method of Fujita et al. (E. S. R., 76, p. 155), and above all the much used indophenol method of Tillmans (E. S. R., 69, p. 9) are all rejected as nonspecific.

A method for the determination of ascorbic acid in urine [trans. title], A. JEZLER and W. NIEDERBERGER (*Klin. Wchnschr., 15 (1936), No. 20, pp. 710, 711, fig. 1*).—An inexpensive transportable set of apparatus for the rapid determination of ascorbic acid by a simplified Tillmans test is described and illustrated. The technic for the test is given, with a discussion of certain precautions which must be taken in the use of this method by a simplified or more elaborate laboratory technic.

It is emphasized that a titration should be completed within from ½ to 2 min. to prevent reaction with other nonspecific reducing substances. A blank test uses from about 0.7 to 0.8 cc of the indicator solution. Consequently the dilution of the material to be tested must never exceed 100 cc or the value of the blank will be too high.

The laborious preparation of the indicator solution can be dispensed with by the use of indicator tablets (Hoffmann-La Roche), each of which corresponds to 1 mg of ascorbic acid. It is pointed out that it is not always the urines with the highest concentration of vitamin C that suffer the greatest percentage loss of reducing properties on standing. The best means of avoiding loss is to use glacial acetic acid to acidify the urine and to keep the material in the refrigerator until the titration can be made.

The portable apparatus consists simply of a 30-cc graduated cylinder, a glass pipette delivering 2 cc, a small bottle closed with a dropper for the glacial acetic acid, and a similar larger one marked at a volume of 50 cc for the indicator. Two cc of the urine is pipetted into the 30-cc graduate and 4 drops (0.2 cc) of glacial acetic acid is added from the dropper. One tablet of the indicator is placed in the 50-cc bottle and distilled water added to the mark. The indicator is then added drop by drop to the diluted urine until a light red color persists for 30 sec. The amount of ascorbic acid in milligrams percent is calculated by subtracting the volume of urine and glacial acetic acid from the volume of urine, glacial acetic acid, and indicator.

The results obtained by this method are slightly higher than with the burette for concentrations below 2 mg percent. Above 10 mg percent the values are somewhat higher than with the regular method but not significantly so up to 30 mg percent. For such cases another reagent glass adapted to high concentrations must be used.

Photometric determinations of urea, uric acid, creatinine, and hemoglobin in the blood of scorbutic guinea pigs, S. P. VILTER and R. JOHNSTIN (*Jour. Nutr., 13 (1937), No. 3, pp. 329–338, fig. 1*).—Determinations were made on six guinea pigs receiving a vitamin C-free diet and two control animals receiving tomato juice supplements to the diet. Since it was found impossible to study the complete blood picture during the short period of acute scurvy, the lives of the experimental animals were prolonged with doses of tomato juice at 4-day intervals. The blood samples were taken from the ears by capillary pipettes for duplicate determinations. The Pulfrich photometer was used for colorimetric comparisons of the four constituents. A color absorption curve was prepared for each constituent, the color filter showing suitable absorption was chosen, and a concentration curve was prepared for use in reading off directly the concentration of the unknown solutions after the percentage of transmission had been obtained in the photometer.

The results show that the urea, uric acid, and creatinine in the blood of the scorbutic guinea pigs did not rise above the normal levels and no abnormality in nitrogen metabolism was found, which agrees with the conclusions of Zilva and his coworkers (E. S. R., 61, p. 290). The creatinine values found in both groups were consistently higher than those usually reported as normal. The results on hemoglobin do not agree with those of other workers, and it is believed that by determining the hemoglobin with the aid of a standard Newcomber plate inserted in a frame and used as a standard for the photometric measurement instead of being used in the ordinary colorimeter, it was possible to detect variations in hemoglobin more accurately than by the other methods previously followed.

Stains recently certified (*Stain Technol., 12 (1937), No. 3, p. 90*).—An annotated list of 12 dyes is given.

Progress in the standardization of stains: Dyes for use in bacteriological media, H. J. CONN (*Stain Technol., 12 (1937), No. 3, p. 89*).—Standardization of crystal violet, basic fuchsin, and brilliant green for this purpose is here recorded.

Chromatograms of biological stains on acid and basic adsorbents, C. H. Lou (*Stain Technol., 12 (1937), No. 3, pp. 119–124, figs. 2*).—This contribution from the University of Minnesota describes a simple method of preparing chromatograms of mixtures of biological stains on common acid and basic adsorbents. From a study of such chromatograms three kinds of preferential adsorption can be recognized. The technic can be used to detect and separate mixtures of stains, to demonstrate the nature of adsorption and the theory of staining, and as a preliminary test for the choice of solvent and adsorbent for chromatographic analysis. For demonstrations an artificial cell can be made by impregnating talc (acid) and magnesia (basic) in collodion, in the form of nucleus, cytoplasm, etc., which is stained by the general histological technic after the collodion has dried.

The use of colloidal iodine as a modification of the Gram stain, D. C. Lyons (*Jour. Lab. and Clin. Med., 22 (1937), No. 5, pp. 523, 524; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 47, 48*).—The author of this contribution from the Michigan Experiment Station finds that Gram's solution of iodine (1 g) with potassium iodide (2 g) in water (300 cc) "does not have sufficient penetrating power to completely fix the cell walls of many types of micro-organisms or their morphologic variants. This may be due to the fact that the solvent KI does not readily give up iodine to the micro-organism." In its place he recommends a 1 percent suspension of colloidal iodine. "This modification is particularly valuable in staining *Treponema microdentcum* in smears taken from the oral cavity or throat. Likewise, *Borrelia vincenti* and *T. macrodenteum* take a clearer and deeper stain, differentiating them from their surroundings and making it possible to demonstrate distinctive characteristics so important in the study of Spirochaetaceae."

The use of n-butyl alcohol in the paraffin method, A. G. Lang (*Stain Technol., 12 (1937), No. 3, pp. 113–117, fig. 1*).—The modifications in technic suggested include a revised series of dehydration solutions for exacting work, an abbreviated schedule of limited usefulness, and a simple method for more rapid paraffin infiltration. A triangular graph is presented which may be valuable in designing dehydration procedures for special purposes. Changes in the primary fixation image are significantly less severe by dehydration procedures than by many other reagents. Such effects may be further minimized by reducing the time and temperature factors to the practical limit and by substituting acetone for ethyl alcohol in a dehydration series such as that of C. Zirkle.

Sterilization of apple juice by flash pasteurization, R. E. Marshall and J. C. Kremer (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 28–34, fig. 1*).—"Apple juice clarified with Pectinol, filtered, heated to 190° F. in a flattened-tube pasteurizer for 7 to 10 sec., bottled and immediately sealed, and stored at approximately 70° remained free of sedimentation, retained color, clarity, and flavor, remained sterile, and had only a trace of an unobjectionable tendency toward a cooked or pasteurized taste. Apple juice flash heated in one unit of the flattened-tube pasteurizer and cooled in a second unit possessed a better quality than that bottled while still hot, but the juice of several bottles of some lots was recontaminated in the process of bottling which resulted in subsequent development of mold mycelia."

A description of the flash pasteurizer used in the experiments is presented, together with directions for the construction of coiled, flattened-tube pasteurizers of various capacities.

AGRICULTURAL METEOROLOGY

Climatic cycles in eastern Oregon as indicated by tree rings, F. P. Keen (*U. S. Mo. Weather Rev., 65 (1937), No. 5, pp 175–188, pl. 1, figs. 7*).—Through the study of tree rings reported in this article, it has been possible to arrive at an index of the ancient climatic history back to the year 1268. Micrometer measurements of annual radial growth of 1,240 ponderosa pines taken in 44 different localities of eastern Oregon have given a statistical basis for this study. "A broad climatic influence has uniformly dominated the growth pattern over a wide area of eastern Oregon and northern California. Any sample of 10 selected trees was sufficient to show the same fluctuations of good and poor growth and outstandingly good and poor years, except for short periods where local influences such as fires, windfalls, or defoliations obscured the general pattern. . . . A significant correlation was found between seasonal precipitation and tree growth. . . .

"The tree-ring record for eastern Oregon indicates that during the past 650 yr. there has been no general trend toward drier or wetter years. . . . Average growth for the 20-yr. period 1900 to 1919 was found to be identical with the average growth during the past 650 yr. There have been important fluctuations in growth throughout the entire period, however, with alternate periods of good and poor growth. All tree-ring measurements agree in showing that a very critical subnormal growth period has existed since 1917. This slowing down of the growth rate is undoubtedly the result of deficient precipitation and lowered water tables. . . . Several other periods have exceeded the present one in duration of subnormal growth, but none has approached it for severity. Growth in 1931, the poorest year, was 68 percent below normal. The tree-ring record indicates that the last period of 19 yr. of drought and poor tree growth represents a major fluctuation in a broad climatic cycle which eventually will be followed by a wet period of better than average growth. No rhythmic cycle has been found which would permit a prediction as to when this reversal in trend will occur."

The constancy of the atmosphere with respect to carbon dioxide and oxygen content, T. M. Carpenter (*Jour. Amer. Chem. Soc., 59 (1937), No. 2, pp. 358–360; abs. in Sci. Abs., Sec. A—Phys., 40 (1937), No. 472, p. 372*).—Analyses of a large number of samples of air collected at widely separated places and under different local conditions showed an average content of 0.031 percent of CO_2 and 20.939 percent of O_2. There was no evidence that variations in season or proximity of large consumers of fuel caused any measurable differences in the content of these constituents of the air.

Nocturnal surface-soil temperatures, air temperatures, and ground inversions in southern Arizona, W. V. Turnage (*U. S. Mo. Weather Rev., 65 (1937), No. 5, pp. 189, 190*).—Comparisons of typical data selected from a large number of observations showed the greatest difference between nocturnal soil and air temperatures to be that observed on a high, isolated peak. "Snow on the peak was considerably colder than both air and soil; the soil was frozen to a depth of several inches. Bare rock nearby, however, was warmer than the air. On the same peak, when there was no snow present, as on the night of January 20, 1936, the air became 0.5° F. colder than the soil; but on the night of May 16, 1936, the soil became 3° colder than the air. At midday in the shade of a cliff at 4,000 ft. elevation, moist soil has been observed to be 12.5° colder than the air. Beneath the surface this soil was frozen, perhaps the result of low temperatures the previous week. However, snow and frozen soil on the mountains are rare during the season of greatest basin inversions."

Spring frosts (*[Gt. Brit.] Forestry Comm. Bul. 18 (1937), pp. 131, pls. 12, figs. 17*).—This is an account of a somewhat elaborate study of spring frosts in Britain, with special reference to the frost of May 1935. It deals with the factors and conditions responsible for spring frosts, the nature of the injury to trees and shrubs caused by late frosts, and means of protection against injuries.

A complex relationship is found to exist between topography, frost intensity, and damage to trees. It is shown that "topography, by checking or promoting the flow of cold air, plays an important part in regard to frost intensity. The degree of damage, however, often depends more upon the stage of development of the buds at the time of the frost than upon the local air currents. The bud stage, in its turn, may be affected by aspect and degree of slope, thus bringing the argument back once more to topography. Other factors such as (1) the relationship of slope to soil conditions, which in turn may affect the rate at which a young tree grows out of the frost zone, (2) exposure to the morning sun, and (3) shelter from wind must also be borne in mind. It is from the interaction of some or all of the above factors that the cause of any given case of frost damage must be sought."

A further aspect of the frost problem to which attention is called is the relation between frost injury and disease. It is pointed out that "frost injury is in itself a form of disease, but may also make possible the development of parasitic disease either by providing injuries through which parasites can enter or by so reducing the vigor of trees that they become a relatively easy prey to such organisms."

Forty-five year precipitation record at State College, N. M., C. P. WILSON (*New Mexico Sta. Press Bul. 832 (1937), pp. 20*).—Daily precipitation records at State College, N. Mex., for 45 years ending with 1936 are summarized. The average annual precipitation for the period was 8.62 in. The wettest year was 1905 with a total precipitation of 17.09 in., the driest, 1910, with a total of 4.02. There is a rainy season beginning about July 10 and lasting usually until the first of September. There is a secondary rainy season beginning about the middle of September and ending approximately the first of October.

Agricultural meteorology: Some characteristics of precipitation in Saskatchewan and Alberta, J. W. HOPKINS (*Canad. Jour. Res., 14 (1936), No. 9, Sect. C, pp. 319–346, figs. 13; abs. in Nature [London], 139 (1937), No. 3508, pp. 145, 146*).—In previous papers (E. S. R., 74, p. 303; 76, p. 587), the author demonstrated significant correlations between variations in rainfall and temperature and yield and nitrogen content of wheat crops grown in central and southern Saskatchewan and Alberta. In the present paper he deals particularly with seasonal precipitation in these districts, and analyzes fluctuations which past experience has shown to occur from year to year in precipitation at a given place and from place to place in the same district during a given year. He found no gross asymmetry in the frequency distribution of seasonal precipitation. The percentage of days on which rain fell showed a distinct seasonal trend during spring and summer, being lowest in April and highest in June. A similar variation was noted in the average amount of rain per rainy day, this being lowest in April and highest in June and July.

Chlorine in rain water in Mauritius, R. LINCOLN (*Mauritius Dept. Agr. Leaflet 41 (1937), pp. 12*).—The author reports average annual amounts of chlorine in rain water at different places in Mauritius, varying from 14.36 to 29.43 p. p. m. during the period 1934 to 1936. The chlorine carried down followed closely the amount of rainfall, increasing as the rainfall became greater.

The meteorology of great floods in the eastern United States, C. F. Brooks and A. H. Thiessen (*Geogr. Rev., 27 (1937), No. 2, pp. 269–290, figs. 19*).—The causes, seasons, and characteristics of great floods in the United States are explained. It is stated that "great floods may occur in the eastern United States at any time of the year, for there is always an extensive warm-water surface nearby from which great volumes of vapor may be transported, while not far distant throughout the year there are cold surfaces to furnish moving wedges of cold air to elevate the tropical air. The polar air masses engage the tropical masses normally every few days, and rains fall. The great floods occur, however, only when a persistent high over the western Atlantic sends the tropical air inland for days in succession, and then only when the polar masses meet and elevate the tropical air over the same area or region for one to several days in succession or on repeated occasions. Topography plays an important role in determining where slowly moving fronts will stall; sometimes even minor divides are effective. Snow cover seldom contributes much to great floods, though by helping to keep cold air masses cold it may contribute to stalling and to the maintenance of the temperature contrast between the cold and the warm air masses."

It is pointed out that floods can be mitigated by maintaining plant cover, by holding back water by numerous dams on small streams and larger dams below, by measurements of rainfall and condition of the ground, and by a rapid system of collecting reports to compute in advance when and how high the water will rise. The rivers can be confined by levees, but temporary diversion of excess waters over capacious lowlands must be provided for. The stream channels can be straightened to hasten the water on its way, but without great care such relief upstream may mean a greater flood downstream. "The operation of control dams and diversions could be more intelligently directed if great rains could be foreseen more than a day or two in advance. This is not impossible, and studies in long-range forecasting are already rather promising. But whatever success may be attainable in weather and river-stage forecasting the main point to bear in mind is that 10-in. rains do fall, sometimes in a few hours, and that if man does not control the speed with which the water reaches the streams and then whither it goes floods will devastate the valleys."

The recent floods in the United States, C. E. P. Brooks (*Nature [London], 139 (1937), No. 3514, pp. 400–402, fig. 1*).—Discussing briefly recent floods in the United States and their disastrous effects, the author states that "the forecasts of the times and heights of flood stages were of incalculable assistance throughout to the patrols and rescue organizations. Without these warnings, the loss of property, and still more of life, would have been enormously greater."

Flood on Republic and Kansas Rivers, May and June 1935, R. Follansbee and J. B. Spiegel (*U. S. Geol. Survey, Water-Supply Paper 796–B (1937), pp. II+21–52, pls. 6, fig. 1*).—The character and consequences of this flood are described and illustrated, and related data are reported.

Monthly Weather Review, [May–June 1937] (*U. S. Mo. Weather Rev., 65 (1937), Nos. 5, pp. 175–217, pls. 8, figs. 13; 6, pp. 219–260, pls. 8, figs. 17*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 5.—Climatic Cycles in Eastern Oregon as Indicated by Tree Rings, by F. P. Keen (pp. 175–188) (see p. 10); Nocturnal Surface-Soil Temperatures, Air Temperatures, and Ground Inversions in Southern Arizona, by W. V. Turnage

(pp. 189, 190) (see p. 10); and The Geometrical Theory of Halos, IV, by E. W. Woolard (pp. 190–192).

No. 6.—A Series of Radiometeorograph Soundings During February–April 1937, by C. Harmantas and D. P. Kelly (pp. 219–229); Formation of Polar Anticyclones, by H. Wexler (pp. 229–236); Meteorological Aspects of Hailstorms in Nebraska, by G. D. Koch (pp. 236, 237); and Thunderstorm Frequencies for 6-Hour Periods at Miles City, Mont., by L. R. Jurwitz (pp. 237, 238).

SOILS—FERTILIZERS

[Soil investigations by the Arizona Station] (*Arizona Sta. Rpt. 1936, pp. 4, 7–13, 14–16, 17, 18, 29, figs. 7*).—Topics dealt with include fertilization of Arizona soils, limiting factors in the fertilization of crops, soil-moisture studies, soil bacteriology, acidulated fertilizers, alkali in lettuce beds, a lysimeter study of the nitrogen balance in irrigated arid soils, soil-reaction studies, and control of high soil temperatures in citrus orchards.

[Soil investigations by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 29, 30, 31, 123, 124*).—This work has included plant nutrition investigations, in which sodium selenate in quantities equivalent to 5 p. p. m. or more of selenium was found to kill wheat plants, and a study of the soil solution as governed by H-ion concentration and other factors, both by A. T. Perkins; influence of the absolute reaction of the soil solution upon the growth and activity of *Azotobacter*, by P. L. Gainey; a study of replaceable cations and anions in some Kansas soils, by H. H. King and Perkins; and soil erosion and water conservation investigations, by F. G. Ackerman.

[Soil Survey Reports, 1933 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, Nos. 7, pp. 48, figs. 2, map 1; 8, pp. 46, pls. 2, figs. 3, map 1*).—The two surveys here noted were made with the cooperation of the North Carolina Department of Agriculture and Experiment Station and the California Station, respectively.

No. 7. *Soil survey of Chatham County, North Carolina*, R. C. Jurney et al.—Chatham County consists of 445,440 acres of lands mostly undulating but ranging from flat to steeply sloping in central North Carolina. Many interstream flats, large areas of the first bottom lands, and small flats in the second bottom lands are ill drained. In other parts drainage is well established.

This report lists 21 series and 34 types. Alamance gravelly silt loam takes up 11.4 percent of the county, about 70 percent of which is forested.

No. 8. *Soil survey of the Barstow area, California*, R. E. Storie and D. F. Trussell.—The Barstow area lies in the southeastern part of California, occupying 182,400 acres in the flood plain of the Mojave River. The sand and gravelly sand of the Daggett series are the most extensive of the classified soils, covering 10.8 and 21 percent of the area. Rough broken and stony lands, unclassified, amount to 6.7 percent. In all, 10 series of 14 types were found. The soils are rated on the basis of their agricultural value, their morphology and genesis are discussed, and laboratory studies are reported.

Soil survey of McDuffie County, Georgia, G. L. Fuller and A. H. Hasty (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 28, pp. 47, figs. 2, map 1*).—This report was prepared with the cooperation of the University of Georgia College of Agriculture.

McDuffie County consists of 168,320 acres in northeastern Georgia, lying partly in the Piedmont Plateau and partly in the Coastal Plain. The drainage outlets for most of the county are Little River and Brier Creek.

The soils found were of 18 series and 28 types. Norfolk sand covers 12.2 percent, and the unclassified areas of rough broken land, undifferentiated alluvium, and swamp take up a further 10.7 percent of the county.

Washington County soils, R. S. and L. H. SMITH (*Illinois Sta. Soil Rpt. 58 (1937), pp. 25, pls. 2, figs. 7*).—Washington County occupies an area of about 364,950 acres in southwestern Illinois. Its lands show little difference in elevation. Drainage is effected mainly by numerous tributaries of the Kaskaskia River.

In the survey here noted 18 soil series were found to be represented, each by a single type. The more extensive of these soils are Bluford silt loam, 18.6 percent; Hoyleton silt loam, 17.8 percent; Cisne silt loam, 14.7 percent; Putnam silt loam, 13.1 percent; and Wynoose silt loam, 12.2 percent.

Characteristics of certain soil profiles of southeastern Washington, P. I. VLASOFF and L. C. WHEETING (*Soil Sci., 44 (1937), No. 1, pp. 65–85, pls. 2*).—The authors studied, at the State College of Washington, four profiles developed from similar material but under conditions of decreasing rainfall from east to west.

"The data show that the texture of the soils becomes coarser from east to west because of differences in rainfall during the process of weathering. The water-holding capacity of the soils increases, with a corresponding increase in the colloidal fraction or in the organic fraction. The heat of wetting of soil colloids was found to be much higher than the heat of wetting of soils. The heat of wetting of soil generally decreases from east to west when corresponding horizons are considered. The nitrogen content follows the trend of the organic matter content. It decreases in crossing the area from east to west. The quality of the colloidal organic matter of the arid and semiarid soils appears to be the same. The reaction of the whole soils and colloids was found to be generally alkaline. No sharp variations were noticed, except in the Uniontown surface soil colloid, which had a slightly acid reaction. The results of the chemical analyses indicate that silica and sesquioxides were present in fairly uniform amounts in all horizons, with the exception of the carbonate layer of each profile and of horizon 2 of the Uniontown soil. These deviations have been explained as the consequence of the translocation processes functioning in the soil.

"The $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$ ratio for extracted colloids varies within the limits of 3 to 3.88 throughout the four profiles, which indicates that the weathering processes producing these materials have been essentially similar. The percentage of calcium and of magnesium in the soil colloids from the upper three horizons changes with increasing depth in the solum, the calcium content decreasing and the magnesium content increasing. Calcium appears to be a constituent of the coarser fractions; magnesium of the finer fractions. An alluvial lime accumulation layer is a feature of all profiles. The variations in sodium content of the extracted soil colloids were so small that no significant deduction can be made from them."

It is concluded that all of the profiles studied represent examples of Pedocal formation. "Although but one representative of each zonal group of soils was analyzed, the results indicate differences which would be significant in making a classification." A nomenclature for horizons of such soils is suggested.

Chemical composition of a heather-peat profile, S. A. WAKSMAN (*Jour. Ecol., 25 (1937), No. 1, pp. 113–115*).—The results of proximate chemical analyses of a heather-peat profile and "flush peat" are reported in a contribution from the New Jersey Experiment Stations.

"The chemical nature of the peat and the transformation processes involved in its formation are characteristic more of lowmoor than of highmoor peats."

Some data on the Mediterranean Red soils, M. PUFFELES (*Soil Sci., 44 (1937), No. 2, pp. 167–174*).—The author has examined 18 soil samples in order

to investigate their properties in relation to "Nazaz" formation. The results appear to support the following general statements:

"The red-sand soil called 'Hamrah' consists of sand and alluvial clay, which are not firmly held together. The cementing link between them has been produced by the exchangeable bases, particularly the cation Ca. Since the soil is very poor in lime and since the citrus plants require for their nutrition large quantities of lime, it is abstracted from the zeolite complex, thereby separating the clay from the silica. Rainfall and irrigation may be expected to have the following effect: The clay penetrates into the lower layers, whereas the sand remains in the upper layers. Since the water contains free hydrogen ions, the hydrogen takes the place of calcium, and consequently the physical properties of the soil are impaired. Because of the difference in solubility (and absorption) of aluminum and iron, separation between them sets in, and, due to lack of oxygen from the air, the lower layers of the soil bear strains and grains of FeO, the quantity of which increases with the degradation of the soil. This results finally in formation of Nazaz (pan) which may be close enough to the surface to impede cultivation.

"The following measures should be adopted to protect the red-sand soil against degradation: The water optimum should first be determined by experiments, thus avoiding surplus of water, which contributes to the separation between the clay and sand. The lime requirements of the plant (when necessary determined by experiment) should be provided for by addition of lime to the soil, thus avoiding the removal of lime from the zeolite complex, which forms a link between the clay and sand. When applying fertilizers it is of the utmost importance to use organic fertilizers in order to produce humus which should serve as a protective colloid. As these soils are low in water-soluble salts and lime and are to some extent shaded from direct sunlight in citrus groves, conditions for humus formation are not entirely lacking provided the organic matter is available."

Physical properties of soils that affect plant nutrition, R. E. Stephenson and C. E. Schuster (*Soil Sci., 44 (1937), No. 1, pp. 23–36*).—From observations made at the Oregon Experiment Station with the cooperation of the U. S. D. A. Bureau of Plant Industry, the authors conclude, in part, that "natural processes provide granulation and structural development for a cetrain amount of aeration in the surface horizons of all soils that are capable of supporting vegetative growth. The significant soil differences appear in the deeper horizons and affect the plant through air-moisture-root relationships. A favorable topsoil is not sufficient to assure good tree growth without irrigation.

"The zone of greatest development of absorbing roots parallels fairly closely the zone of humus accumulation. This same soil zone carries the greatest amount of soluble and supposedly available nutrients. Trees fail for the most part when the major root development is confined to the zone of available nutrients. These observations lead to the conclusion that the deep roots serve chiefly for drawing necessary moisture from the deep soil. There must be an advantage, however, in those soils that contribute nutrients as well as moisture from the deep horizons. . . .

"Favorable soil structure must extend to a depth of 8 to 10 ft. to permit deep rooting and the use of moisture. Although more than half the total absorbing root system in the best soils is in the top 8 ft., the remainder (somewhat less than half the total) in the 8- to the 10-ft. level is the limiting factor in tree growth and production where irrigation cannot be practiced."

Studies on soil structure: Some physical characteristics of puddled soils, W. T. McGeorge (*Arizona Sta. Tech. Bul. 67 (1937), pp. 127–177, figs. 8*).—The author reports a detailed and exhaustive study of the course and result of

the puddling process in soils, presenting in tabular and graphic forms experimental results and conclusions. The phases of the subject experimentally dealt with were mechanical methods of analysis, including comparison of mechanical methods, effect of pretreatment with hydrochloric acid, composition of soil separates, dispersing agents, and effect of time on dispersion; puddling ratio as measured by percentage of suspended solids, including, with other work, the effect of boiling at reduced pressure and the effect of replaceable bases upon the puddling ratio; structural stability and settling volume; percentage of soil colloids as determined by water adsorption; and determinations of the percentage of aggregates.

"As we approached the moisture equivalent the soil became increasingly sticky, reaching a maximum state of puddling at a moisture content closely approximating the moisture equivalent. Beyond this critical moisture content the soils became less puddled as we proceeded from the liquid in solid, or plastic, state to the solid in liquid, or fluidity, state. That is, the puddling decreased beyond the moisture equivalent, and the only mechanical effect noted on working with an excess of water was a *dispersion* or break-down of the crumb structure. . . .

"As applied to our soils it was found that the percent soil particles remaining in suspension at an arbitrary time interval was closely related to the amount of *moisture present in the soil when it is mechanically worked by a method* designed to produce puddling. The maximum percentage of suspended solids is shown when the soil is worked at a moisture content closely approximating the moisture equivalent. Since this value may be greater than that obtained *by completely dispersing the soil in a dispersion cup with NaOH*, we were led to conclude that puddling and dispersion are radically different phenomena. This study further suggested that the ratio between the percentage of suspended solids in a completely dispersed soil and the percentage of suspended solids obtained under any other condition may be used to express the degree of puddling."

The dilatometer method for determining the moisture equivalent of soils, G. J. Bouyoucos (*Soil Sci., 43 (1937), No. 5, pp. 385–389; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, p. 51*).—Experimental results support the conclusion that the dilatometer method "possesses the following advantages: (1) It is comparatively free from the influence of external factors and is consequently less empirical, and the results are on a more nearly absolute basis; (2) it makes two important determinations at the same time—the moisture equivalent and the wilting point; (3) it is rapid and simple; (4) the apparatus required is simple and inexpensive."

Some moisture relations of the soils from the erosion experiment stations, L. B. Olmstead (*U. S. Dept. Agr., Tech. Bul. 562 (1937), pp. 45, figs. 7*).—Studies of the relationships of seven soil-moisture constants of the soils of the soil erosion stations of the Department are reported. Of these constants centrifugal moisture, minimum water of saturation, and normal moisture capacity are new.

"The centrifugal moisture, which is the moisture held by soil material when centrifuged in a small bearingless air-driven centrifuge at 300,000 gravity, has a slightly higher average value than the water-vapor absorption at 99 percent relative humidity but probably a somewhat lower value than the permanent wilting percentage. The data presented indicate that the moisture equivalent should not furnish a reliable measure of the permanent wilting percentage of soils.

"The normal moisture capacity [for the estimation of which a method is given] appears to furnish a more accurate measure of the field capacity of soils than does the moisture equivalent."

Procedures for the determination of the minimum water of saturation, which is the percentage of water required to saturate a soil sample when the soil grains are arranged in position of closest packing, are given. The test was found to be made most accurately and easily in the case of nonplastic soils. The average value is slightly lower than that for the sticky point, but it is more closely related to the clay content than are the other moisture constants.

"The sticky-point data obtained by adhesion tests may differ considerably from those obtained by shearing methods. A simple roller device, applicable to plastic soils only, is presented and recommended as a basis for a standardized sticky-point or scouring-point procedure of the shearing type. The addition of small quantities of sodium hydroxide lowered the sticky point and lower plastic limit of lateritic and noncalcareous soils. . . .

"A statistical study of soil-moisture constant data shows the centrifugal moisture and water-vapor absorption at 99 percent r. h. to be closely related, as also are the lower plastic limit and the sticky point. The data indicate that the minimum water of saturation, normal moisture capacity, moisture equivalent, centrifugal moisture, and water-vapor absorption are controlled chiefly by the mechanical composition of the soil and run parallel to the settling volume. The lower plastic limit and the sticky point are not so closely related to texture and are influenced to a greater extent by the chemical character of the colloid than are the other moisture constants."

Bibliography on soil and water conservation and hydrology (*Saint Joseph, Mich.: Amer. Soc. Agr. Engin., 1937, pp. [1]+23*).—This mimeographed bibliography is a contribution of the committee on soil erosion of the American Society of Agricultural Engineers.

The effect of land use and management on erosion, E. H. Reed and J. I. Falconer (*Ohio Sta. Bul. 585 (1937), pp. 19, fig. 1*).—The results of a study conducted in cooperation with the U. S. D. A. Soil Conservation Service are summarized. The report is based upon a study of 100 farms located in four Soil Conservation Service demonstration project areas in the State, aggregating a little over 184,000 acres.

The results are taken to indicate that under Ohio conditions there are a number of factors within the control of man which contribute to erosion. Studies of individual case histories show considerable variation as to the importance of specific factors. There is likewise no one outstanding remedy. Changes in land use or the establishment of single control practices, such as terracing or strip cropping, may aid in controlling erosion but would evidently not constitute a complete erosion-control program for all farms. The practices prevailing on many of the farms were as frequently a result of past erosion as they were a factor leading to current erosion.

The less eroded farms had a larger percentage of their land in erosion-resisting crops, such as meadow, pasture, and woods; a larger percentage of their cultivated crops on the more gentle slopes; used rotations containing a larger percentage of erosion-resisting crops and a smaller percentage of clean-cultivated crops; and used lime and fertilizer in larger applications per acre and on a larger percentage of their crop land. There was also a lower percentage of tenancy, a longer period of occupancy per tenant, and a longer period of ownership per owner on the less eroded farms, a smaller percentage of these farms was mortgaged, and the mortgage indebtedness per acre was smaller.

Yields of corn on the less severely eroded farms were 25 percent above those more severely eroded. Furthermore, the less severely eroded farms had maintained crop yields, whereas yields per acre had declined on the more severely eroded farms. Incomes were 65 percent larger on the less eroded farms. Low incomes may be a result of erosion, and also a contributing cause through preventing the establishment of erosion-control measures. On the less eroded farms the majority of the buildings were maintained in good condition, whereas on the more severely eroded farms they were in poor or fair condition.

Wind erosion and its control, R. R. DRAKE (*Agr. Engin., 18 (1937), No. 5, pp. 197, 198, 200, figs. 2*).—This is a brief contribution from the U. S. D. A. Soil Conservation Service describing methods of soil manipulation best adapted to the control of wind erosion.

The influence of hydrogen peroxide treatments on the exchange capacity of Maryland soils, J. B. BARTLETT, R. W. RUBLE, and R. P. THOMAS (*Soil Sci., 44 (1937), No. 2, pp. 123–138*).—In a study carried out at the Maryland Experiment Station, the authors determined the loss of exchange capacity occasioned by oxidation of the soil organic matter content of a number of Maryland soils. The total exchange capacity was obtained by leaching with ammonium acetate and measuring the amount of ammonia absorbed. The organic matter was oxidized with 6 percent hydrogen peroxide. Total carbon determinations were made to measure the amount of organic matter in each soil before and after oxidation. Both the exchange capacity and organic matter were estimated before and after the treatment with hydrogen peroxide. The soils studied and results obtained were grouped according to their series and class within the five soil provinces.

"The Coastal Plain soils had the largest percentage of organic matter which was active in the exchange complex. The coarser or sandy classes in this group had the highest percentage of the total exchange capacity in the organic form. The percentage of organic matter taking part in the total exchange capacity was practically the same in the Piedmont and Coastal Plain soils. The finer textured soils in all the provinces, except the Coastal Plain soils, showed the greatest loss in exchange capacity by oxidation. The average value of the organic exchange complex obtained or, conversely, the amount of the complex destroyed by oxidation, was similar for the Appalachian Mountain and Plateau, the Limestone Valleys and Uplands, and the River Terrace and Flood Plain soils. A statistical study of all the values obtained for the loss in organic matter and the loss in exchange capacity for all the soils as a unit showed a highly significant correlation."

Changes in organic matter in western Washington soils as a result of cropping, L. C. WHEETING (*Soil Sci., 44 (1937), No. 2, pp. 139–149*).—An examination of 73 pairs of samples of virgin soils and cropped soils of known agricultural history, representing seven soil series, with especial attention to the changes that have taken place in the organic portion, was made at the Washington Experiment Station. The results indicate that there has been an increase in the quantity of organic matter under cropping in western Washington. For all samples examined this increase amounts to about 28 percent.

"The quality of the organic matter is much improved as a result of cropping. This is probably associated with the change in the soil from the forest type to the cereal type of organic residue. The greatest increases in quantity and quality of organic matter as a result of cropping occur under the better systems of soil management, which add organic material to the soil regularly. Under such management, western Washington soils have maintained a superiority over virgin soils for at least a 45-yr. cropping period."

The significance of inorganic spray residue accumulations in orchard soils, J. S. JONES and M. B. HATCH (*Soil Sci., 44 (1937), No. 1, pp. 37–63, pl. 1*).—That soil accumulations of spray residues do not affect tree growth in commercial orchards is found by the authors of this contribution from the Oregon Experiment Station to be due to the fact that usually these compounds "penetrate the soil mass only to such depth as they are carried mechanically by orchard tools of cultivation—approximately 6–8 in. Since tree root systems in the main distribute themselves in lower horizons of the soil profile, the major part of their absorbing portions do not contact the portion of the soil mass in which the increase of arsenic, lead, and copper-containing minerals occurs."

With regard to the suggestion that the occasional failure of cover crops in orchards may be a result of spray residue accumulation, the authors are of the opinion that "since cover crops in general are surface-feeding crops, and the surface localization in orchard soils of spray residue accumulation has been shown, this suspicion may be well founded, even though the suspected relationship of cause and effect proves eventually to be indirect only."

A further possibility of danger from soil accumulations of toxic elements lies in the fact that "in time commercial orchards will give way in rotation to the annual surface-feeding food and forage crops. The root systems of these crops must contact during their entire growing period that part of the soil mass in which lies many years' accumulations of inorganic spray residues. If the situation is not so bad as to prevent growth altogether, it will cause root absorption and assimilation in edible parts by these plants of maximum amounts of chemical elements toxic in the animal body. It is not yet definitely known how surface-feeding plants will respond under these conditions in the matter of intake and assimilation. The limited amount of evidence, however, points to both increased root absorption of arsenic, lead, and copper and increased assimilation of each by aerial and edible parts."

The occurrence of Azotobacter in Iowa soils and factors affecting their distribution, W. P. MARTIN, R. H. WALKER, and P. E. BROWN (*Iowa Sta. Res. Bul. 217 (1937), pp. 225–256, figs. 3*).—An examination of 287 Iowa soils representing 52 soil types and 37 soil series showed that 35.2 percent contained *Azotobacter*.

Although the authors do not consider the results obtained by them thus far to be conclusive, their results indicate that lime treatment of some Iowa soils in which *Azotobacter* was not found before treatment induced a growth of this organism. The further addition of rock phosphate did not induce a further increase in the growth of *Azotobacter*. The available phosphate content of the soil affected the growth of the organism, however, to the extent that growth was usually not found, regardless of favorable soil pH value, when the available phosphate content was less than 35 lb. per acre.

"It may be concluded . . . that *Azotobacter* do not occur to any great extent in Iowa soils; that the high acidity of the majority of these soils is the most important factor limiting their occurrence, although the available phosphate content may also be of importance in this respect; and that, other factors being favorable, the amount of growth which the *Azotobacter* will make depends largely upon the organic matter content of the soil and upon the pH."

Advantages of the use of the law of diminishing returns in the layout of fertilizer test plots, E. O. FIPPIN (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 277–289, figs. 6*).—The layout of plat treatments proposed in this contribution from the Tennessee Valley Authority comprises one, two, three, and even four elements in basic amounts and scientific proportions in five or more graded rates of application, using the principles of diminishing returns, ratio triangle, and

the dominant composition of crops and soils. A number of advantages over prevailing diverse layouts are cited.

The effects of fertilizers on the productivity of Sagemoor fine sandy loam under irrigation, H. P. Singleton and L. C. Wheeting (*Washington Sta. Bul. 346 (1937), pp. 26, figs. 7*).—"When a soil in an arid region is brought under cultivation for the first time through irrigation it becomes a medium for crop production under a different moisture environment from that in which it was formed. Besides being maintained in a moist condition throughout the growing season, the newly irrigated soil is subjected to a generally downward movement of water in the profile, which is quite the opposite of its natural condition. This new moisture regime undoubtedly changes the nutritive conditions within the soil. Cultivated plant residues accumulate, and the character of the soil organic matter changes."

A series of irrigated plats have been maintained at the Irrigation Substation at Prosser since 1922 on a new area of Sagemoor fine sandy loam soil. A rotation of potatoes, corn, and spring wheat has been used. Fertilizers and soil amendments have been added annually. In 1933, after four full rotations, the soils were sampled and examined in the laboratory. The results of the cropping as shown in yield data and the effects on the soil as shown in chemical analyses are here reported.

"Throughout the cropping period, potato yields have tended to decrease regardless of treatment of the soil. The analyses show that some treatments improved the quality of the soil, but the effect on potato yields was not observable. It is likely that environmental factors such as the presence of wireworms and plant diseases may have influenced the results. Corn and spring wheat yields have tended to increase as the cropping proceeded, especially in those cases where beneficial soil treatments were made. The most beneficial treatments were those which added nitrogenous organic matter to the soil.

"Fish scraps, horse manure, sheep manure, and alfalfa hay have been the most effective treatments insofar as increased yields are concerned. All of these materials supplied the soil with organic matter. The use of straw alone, however, was not effective because of the poor quality and wide carbon: nitrogen ratio of this material. Among the inorganic fertilizers, ammonium sulfate was most effective in increasing yields, followed by a mixture of sodium nitrate and gypsum. Sodium nitrate alone was slightly less effective than the foregoing mixture. Treble superphosphate and bonemeal gave some increases in yields. Potassium sulfate and gypsum, when used alone, had but little favorable influence on yields.

"Regardless of soil treatment, there was a strong tendency for calcium to accumulate under irrigation conditions. Eventually this may cause effects on plants similar to those resulting from overliming. The growing of plants rich in this nutrient may be one method of counteracting this tendency.

"The experiments show that successful soil management must include provisions for the frequent application of fresh organic matter of high quality. It appears that the use of forage legumes in the cropping system will most effectively accomplish this purpose. For continued fertility of soils such as this, the utmost attention must be given to the supply of organic matter and available nitrogen."

Ammonium and nitrate nitrogen nutrition of barley at different seasons in relation to hydrogen-ion concentration, manganese, copper, and oxygen supply, D. I. Arnon (*Soil Sci., 44 (1937), No. 2, pp. 91–121, pls. 4, figs. 8*).—The author describes water culture methods devised at the California Experiment Station for the study of ammonium and nitrate nitrogen nutrition of young

barley plants grown at different seasons with control of the variables of reaction, aeration, and concentration of certain "microelements", particularly manganese and copper.

"The effect of the external reaction, maintained at pH 5, pH 6, or pH 6.7, on the growth of plants was modified by season. In the spring the ammonium plants grew best at pH 6 but failed to excel at that reaction in the fall. The nitrate plants made best growth at pH 5 in the fall but did not show any significant advantage at that reaction in the spring. Plants grown in either ammonium- or nitrate-containing culture solutions, maintained at pH 4, showed definite injury during both the spring and fall seasons. Growth of ammonium plants was affected extensively and favorably by either forced aeration of the culture solution or by the addition of manganese, copper, or certain other metals, without forced aeration. The proper adjustment of the culture solution with respect to these factors has made it possible to produce ammonium plants not inferior to nitrate plants at every season at which experiments were performed. The increase in dry weight of ammonium plants obtained by the proper adjustment of aeration of the culture solution and the concentration of metals was as much as 400 percent for shoots and 800 percent for roots. The effects of these factors on the nitrate plants were relatively small."

Some general views of the possible functions of catalytic metals and aeration of roots in relation to the utilization of ammonium and nitrate nitrogen are discussed.

Production and agricultural use of sodium nitrate, A. R. Mehs and C. C. Fletcher (*U. S. Dept. Agr. Circ. 436 (1937), pp. 12*).—This is a brief semipopular account of the extraction and preparation of natural sodium nitrate, the manufacture of the salt synthetically, and its use separately and in mixed fertilizers.

Manufacture and use of commercial fertilizers, A. W. Blair (*Shade Tree, 8 (1935), No. 11, pp. [2, 3]*).—The author of this brief popular article from the New Jersey Experiment Stations presents an outline of the sources and treatment of raw materials, the preparation of commercial mixed fertilizers, and the conditions governing the practical use of such preparations.

AGRICULTURAL BOTANY

The natural vegetation of Arizona, A. A. Nichol (*Arizona Sta. Tech. Bul. 68 (1937), pp. 181–222, pl. 1, figs. 23*).—The descriptions given of the various vegetation types in the State are generalized statements of the composition, use, and apparent controlling factors that have determined their development and present types.

The 3 main natural divisions of the plant cover in the United States are forest, grassland, and desert shrub. These are further subdivided into 22 types, of which the 10 found in the State are here described. The forest (33 percent of the total area) is divided into 3 types—Douglas fir-ponderosa (yellow) pine, which includes all species of fir, spruce, and pine except piñon; piñon-juniper; and chaparral. The grassland (25 percent) is also divided into 3 types—highland grass (short grass), desert land grass (mesquite grass), and mountain meadow (alpine grassland). The desert shrub (42 percent) is divided into 4 types—sagebrush (northern desert), paloverde-cacti (southern desert), creosotebush—*Atriplex* (southern desert), and mesquite bosques (southern desert). A concluding section discusses the uses of native plants by the Indians.

Human and physical resources of Tennessee.—III, Flora, C. E. Allred, S. W. Atkins, and B. D. Raskopf (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol.*

Dept. Monog. 42 (1937), pp. [1]+V+32–36, figs. 2).—"This is one of a series of monographs dealing with the principal economic, social, and civil aspects of the State." The part on "flora" deals with the variety and abundance of plants; the plant regions (subalpine, mountain, valley, and western Tennessee), with a map showing the distribution of dominant species of merchantable timber; and the floral uses, including the economic value, soil protection, and aesthetic value of plants. A bibliography of 10 titles is included.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, July 1 to September 30, 1934 (*U. S. Dept. Agr., Inventory 120 (1937), pp. 26*).—This number presents the usual annotated list of 628 lots of plant material introduced for testing in the United States.

Three thousand mycological terms, W. H. SNELL (*Providence: R. I. Bot. Club, 1936, pp. 151, pls. 12*).—This list is intended to include the technical terms ordinarily used in college courses in the morphology of the fungi and in mycology, and in addition to give the special meanings of technical and ordinary words and phrases used particularly in describing the agarics, boletes, and polypores for the benefit of amateur mycologists.

Thermostable activating factors of cryptogamic origin favoring the growth of bacteria [trans. title], A. and R. SARTORY, J. MEYER, and M. J. MERGLER (*Compt. Rend. Acad. Sci. [Paris], 203 (1936), No. 3, pp. 280–282*).—The growth-promoting factors for bacteria studied were obtained from *Aspergillus fumigatus*, *Schizosaccharomyces hominis*, and *Mucor* spp. A specificity was found to exist between certain fungi and certain bacteria, and data are presented on the affinities between three categories of cryptogamic filtrates and three groups of bacteria.

Studies on the nodule bacteria, VI, VII, A. ITANO and A. MATSUURA (*Ber. Ōhara Inst. Landw. Forsch., 7 (1936), No. 3, pp. 359–401, pl. 1*).—The following papers are included:

VI. *Influence of different parts of plant on the growth of nodule bacteria.*—The influence of seeds, nodules, roots, and stems with leaves of genge (*Astragalus sinicus*) and white clover, fresh and dried, on three strains of the nodule bacteria of genge and one strain each of bean and clover was investigated.

VII. *Influence of the extract of nodules on the growth of nodule bacteria.*—Using strains of nodule bacteria from genge, bean and clover, and the nodules from genge and bean, the growth accessory substance in the nodules was best extracted by water, followed in order by alcohol and chloroform, while ethyl ether, acetone, benzene, and petroleum were ineffective. No definite relation was found between the accessory substance, alkaloids, and nitrogen contents of the nodules.

Obtaining and culturing haplonts of Ustilago tritici [trans. title], M. LANGE-DE LA CAMP (*Phytopath. Ztschr., 9 (1936), No. 5, pp. 455–477, figs. 16*).—By holding for 3–4 days at 2°–4° C., the author obtained promycelia which split up into their four haploid parts in such a way that the latter were uninjured and could be isolated and their further development followed.

The sterilization of culture media by cold and its significance for the pure culture of micro-organisms [trans. title], G. SCHWEIZER (*Arch. Mikrobiol., 7 (1936), No. 3, pp. 297–314, figs. 3*).—An apparatus and procedure are described for the sterilization of media by low temperature, said to be particularly applicable to organic media, to the preservation of enzyme activity, to physiological studies of micro-organisms, and to tissue culture studies.

Electroinjection as a method for phytophysiological studies [trans. title], S. PRÁT and A. GLAZUNOV (*Protoplasma, 27 (1936), No. 1, pp. 78–85, figs. 10*).—

A method is described whereby specific cations may be introduced into living tissues and cells without the simultaneous influence of foreign anions.

An inexpensive recording manometer, F. J. Nutman (*Ann. Bot.* [*London*], *n. ser.*, *1* (*1937*), *No. 1*, *pp. 205*, *206*, *figs. 2*).—The author describes and illustrates a cheap, simply constructed manometer claimed to render the advantages of the resistance porometer more widely available.

Cooling device for the microtome, K. W. Cooper and R. H. MacKnight (*Stain Technol.*, *12* (*1937*), *No. 1*, *pp. 25–27*, *figs. 2*).—For chilling the blade and paraffin block a sheet of duraluminum is cut and folded according to the pattern illustrated and described to serve as ice carrier.

First investigations of the relations between soil activity and plant growth, using a new physical method of measurement—Preliminary contribution [trans. title], K. M. Müller (*Phytopath. Ztschr.*, *8* (*1935*), *No. 6*, *pp. 623–632*, *figs. 2*).—The author presents data relative to the existence of earth rays and to their effects on plant growth and on the divining rod reaction, and describes an electric instrument for measuring the intensity of such radiation objectively.

Regulative phenomena in the water intake and rate of conduction in Vicia faba roots [trans. title], A. Brewig (*Jahrb. Wiss. Bot.*, *82* (*1936*), *No. 5*, *pp. 803–828*, *figs. 7*).—The water absorption was determined for six zones of the individual roots. The rate of conduction corresponded with that of the transpiration stream in the shoots.

The influence of wilting on the water balance and carbohydrate metabolism in leaves of some tobacco varieties of different degrees of drought resistance [trans. title], S. D. L'vov (Lvoff) and S. S. Fikhtengol'ts (Fichtenholz) (*Trudy Bot. Inst. Akad. Nauk SSSR, Eksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS. Bot. Expt.*), *4. ser.*, *No. 2* (*1936*), *pp. 149–223*; *Ger. abs.*, *pp. 215–221*).—The drought-resistant Dübek 44 and American 571 and the drought-susceptible Dehli tobaccos were used in the wilting tests reported. Under wilt conditions there arises in the plant a stimulus under the action of which starch hydrolysis produces an active saccharose. Drought-resistant plants possessed this power in a higher degree than the nonresistant forms.

The influence of various methods of plant hardening on their drought resistance under different conditions of mineral nutrition [trans. title], K. S. Semakin (*Trudy Bot. Inst. Akad. Nauk SSSR, Éksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser.*, *No. 2* (*1936*), *pp. 225–227*, *figs. 4*; *Ger. abs.*, *pp. 269*, *270*).—Resistance to the lowering of the water content of the aerial parts of the plant, accompanied by loss of turgor, can be strengthened or weakened by changes in the water economy taking place during the preceding period of development of the plant. This "hardening" can be attained by preliminary holding of the plant under conditions of (1) lowered soil moisture, (2) increased concentration of the soil mineral solution, or (3) raised soil temperature (40°–45°). The mechanisms of these factors are discussed. Hardened plants show no special outer anatomical-morphological or physiological changes. The conditions under which hardening proceeds are those relatively unfavorable to growth and production of dry substance. The temporary wilting which hardened plants undergo without cessation of life activities leads to a definite lowering of the production of vegetative mass—apparently as a result of the weakening of photosynthesis.

The hardening phenomenon as a process taking place in the protoplasm of living cells doubtless acts on all the physiological and anatomical-morphological factors. In order to clarify fully the mechanism of the process, methods are necessary which will permit controlling the condition of the protoplasm itself.

A bibliography of 51 titles is appended.

Factors affecting cold resistance in plants, S. Dunn (*Plant Physiol., 12 (1937), No. 2, pp. 519–526; also New Hampshire Sta. Sci. Contrib. 50 (1937), pp. 519–526*).—An outstanding characteristic of herbaceous plants tested for cold resistance is the individual variation in reaction. In an attempt to eliminate such variations experiments were devised by the New Hampshire Experiment Station to test the effects of some of the environal conditions. Growing cabbages at different constant soil moisture levels or with high and low amounts of nitrogen, phosphorus, and potassium did not affect the degree or uniformity of hardiness. A cool growth temperature for potatoes and cabbages also failed to eliminate individual variations within a group, but caused a greater average survival from freezing than a warm temperature. Vegetative propagation of survivals of cold exposure in groups of *Bryophyllum* and Jerusalem-artichokes for several generations indicated that the average hardiness within a group can be increased temporarily, but eventually falls back to the original condition. It is believed that the effect of some other factor acting in cooperation with selection, such as growing at a cool temperature, is required to hold the average survival at a high level.

The influence of atmospheric humidity upon the suction force of the plant shoot, with special reference to the stomatal aperture, T. Tagawa (*Japan. Jour. Bot., 8 (1936), No. 1, pp. 85–94, figs. 4*).—Using *Phaseolus vulgaris*, an inverse proportion was noted between the suction power of the shoot and atmospheric humidity when the latter was relatively high, but when it was low the suction power remained almost constant even with decrease in humidity. Under a constant, continuous illumination an inverse proportion occurred between stomatal opening and humidity. In a saturated atmosphere the stomata were nearly closed and their opening was accompanied by a decrease in humidity, but beyond a certain limit no increase in stomatal aperture was seen even with decrease in humidity. The reactions under comparable conditions in darkness were similar but less marked. It is concluded that a relation exists between stomatal opening and transpiration.

The effect on the behaviour of stomata of alternating periods of light and darkness of short duration, F. G. Gregory and H. L. Pearse (*Ann. Bot. [London], n. ser., 1 (1937), No. 1, pp. 3–10, figs. 3*).—Transition from darkness to alternating light led to partial opening, while passage from full to alternating light led to partial closure of the stomata. With each duration of alternating light a fairly definite equilibrium position was reached, at which a minimum opening was obtained with alternations of 45 seconds' duration. With longer or shorter alternations the stomata at equilibrium had a larger aperture. Evidence for rhythmical variations in the size of the stomata appeared in the records.

The influence of light on the stomatal opening, T. Tagawa (*Japan. Jour. Bot., 8 (1936), No. 1, pp. 95–112, figs. 8*).—The author concluded from tests with *Phaseolus vulgaris* that the diurnal course of stomatal movements may be interpreted as a result of the diurnal variation in light intensity. A similar relation was noted for nyctinastic movements of the leaves. So far as these movements are related to cell turgor and to light reactions they are deemed to be similar phenomena.

Phototropism and the extensibility of cell walls [trans. title], F. Gessner (*Jahrb. Wiss. Bot., 82 (1936), No. 5, pp. 796–802, figs. 4*).—Irradiation of growing *Helianthus* hypocotyls with visible light reduced the elastic and plastic cell-wall extensibility. Hypocotyls of *Lupinus luteus* which had already stopped their growth stretching were not influenced in this respect by such irradiation.

The stimulatory process in the phototropic excitation of Phaseolus nodes [trans. title], E. Bünning (*Jahrb. Wiss. Bot., 84 (1937), No. 3, pp. 335–357,*

figs. 7).—This is a study of the mechanism of phototropic variation in movements of the primary leaves of *P. multiflorus*.

The influence of wounding on photosynthesis [trans. title], H. F. NEUBAUER (*Phytopath. Ztschr., 9* (*1936*), *No. 5, pp. 517–530, figs. 6*).—Using beech, hornbeam, elm, Japanese quince, hazelnut, etc., the author studied the effects on the intensity of assimilation of ringing the bark of twigs around the leaf studied, of cutting off the twig over the leaf tested, and of other wound treatments.

The role of oxygen in the process of turning green [trans. title], V. N. LÛBIMENKO (W. N. LUBIMENKO) and N. N. GORTIKOVA (*Trudy Bot. Inst. Akad. Nauk SSSR, Èksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2* (*1936*), *pp. 113–148, figs. 2; Fr. abs., pp. 145, 146*).—This is a biochemical study of chlorophyll synthesis in etiolated seedlings of wheat and maize, with a bibliography of 40 titles.

A review of recent work on the nitrogen metabolism of plants, I, H. S. MCKEE (*New Phytol., 36* (*1937*), *No. 1, pp. 33–56*).—This part discusses the absorption and assimilation of nitrogen (inorganic and organic compounds and gaseous nitrogen), the formation of amino acids and protein in the plant, plant proteins, the chemistry of protein break-down, the deamination of amino acids, and the regulation of protein formation and break-down in the plant. About five pages of bibliography are included.

A study of the effect of blue-violet rays on the formation of carbohydrates in leaves, R. H. DASTUR and S. SOLOMON (*Ann. Bot.* [*London*], *n. ser., 1* (*1937*), *No. 1, pp. 147–152*).—"The importance of the blue-violet rays in the photosynthetic process is demonstrated quantitatively."

Studies of the fat metabolism of germinating pumpkin [trans. title], U. WEBER (*Ber. Deut. Bot. Gesell., 54* (*1936*), *Gen. Versammi. Heft. 1, pp. 70–75, figs. 5*).—This is a study of the growth and metabolism (especially of fats) of seedlings in water and in potassium acetate solution. The data include lengths of root and hypocotyl, iodine number, crude fat content, and fresh and dry weights in the two media.

Absorption of phosphorus by plants in relation to the concentration of hydrogen ions in the medium, A. KOZLOWSKA (*Protoplasma, 27* (*1936*), *No. 1, pp. 9–31*).—Forest, peat-bog, aquatic, and ubiquitous plants, taken from natural conditions in the field and kept for 5 days in acid and neutral solutions (1/1000 N and 1/100000 N solution Na_2HPO_4), showed different capacities for phosphorus absorption, depending on the ecological character of the plant itself and on the H-ion concentration of the solution.

The physiology of tannin in the plant cell, III [trans. title], W. HAUSER (*Protoplasma, 27* (*1936*), *No. 1, pp. 125–130*).—Supplementing previous studies (E. S. R., 76, p. 604), the results support the hypothesis that tannins in the plant organism play the role of protective colloids in relation to the homogeneity of the plasma.

The influence of unknown external factors in experiments with Avena sativa.—*Contribution 19 on the growth-promoting substances of plants* [trans. title], F. KÖGL, A. J. HAAGEN-SMIT, and C. J. VAN HULSSEN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 241* (*1936*), *No. 1–3, pp. 17–33, figs. 12*).—The paper considers the influences of fluctuations during daily periods, weather factors, electrical phenomena, and fluctuations in the respiratory intensity of oats.

The dependence of growth of the Avena coleoptile and its so-called growth-substance production on the auxin content of the endosperm [trans. title], R. POHL (*Planta, Arch. Wiss. Bot., 25* (*1936*), *No. 5, pp. 720–750, figs. 17*).—This paper reports studies on the growth substance of the coleoptile

and endosperm of oats, its extraction from the endosperm, and the addition of growth substance to the endosperm and its effect on the length of the coleoptile. It is concluded that the growth of the coleoptile depends on the growth-substance content of the endosperm.

A deseeded Avena test method for small amounts of auxin and auxin precursors, F. SKOOG (*Jour. Gen. Physiol., 20 (1937), No. 3, pp. 311–334, figs. 8*).—The method described is said to permit quantitative determinations of about 10 times as low concentrations of hormone as the standard method, through an increase in the time of the test (so that nearly all the hormone can be utilized), and through an increase in the sensitivity of deseeded plants to unilaterally applied small concentrations of hormone. The effect of deseeding in relation to curvature consists primarily in the prevention of auxin regeneration through the removal of the material for auxin synthesis and also in the prevention of physiological aging. The mechanisms of auxin synthesis in the coleoptile tip and of auxin regeneration in the new physiological tip are shown to be identical. Applications of the deseeding method are illustrated by determinations of auxin in primary leaves and coleoptiles of oat seedlings.

The method has also been used as a test for precursors of auxin obtainable from the coleoptile and from other sources, and it further permits a distinction between auxins and these substances which may become activated by the plant. Evidence of a precursor of auxin in the plant is given indirectly by determinations of the decrease in auxin synthesis in deseeded plants and directly by its isolation from the plant. Precursors of heteroauxin are also demonstrated, and their chemical nature and activation are considered briefly.

The influence of a phytohormone on the correlation activity of the cotyledons of Pisum sativum [trans. title], B. PILCH (*Bot. Centbl., Beihefte, 55 (1936), Abt. A, No. 3, pp. 358–415, figs. 4*).—The studies were carried out with heteroauxin and with other hormones and chemicals in comparison.

Cotyledonary resistance and lability studied in Phaseolus vulgaris, I [trans. title], G. ZANONI (*Arch. Bot., 12 (1936), No. 3–4, pp. 350–357, figs. 2*).—This reports the results of a study of the biochemical differentiation of the cotyledons during the maturation of the seed of *P. vulgaris*.

Further studies on cotyledonary resistance and lability, II [trans. title], G. ZANONI (*Arch. Bot., 12 (1936), No. 3–4, pp. 358–370, figs. 3*).—This is a continuation of above study.

The respiratory quotient of seedlings of Lupinus albus during the early stages of germination, F. N. CRAIG (*Jour. Gen. Physiol., 20 (1937), No. 3, pp. 449–453, fig. 1*).—In germinating seedlings the respiratory quotient was unity. After a drop to 0.76 at 9 hr. the value rose to 0.90 at 12 hr. and then fell to 0.64 at 60 hr. It is deemed improbable that the fat oxidation system is the first to become activated.

The development of the leaf of Vitis vinifera and some of the laws of its structure [trans. title], O. SARTORIUS (*Gartenbauwissenschaft, 10 (1937), No. 5–6, pp. 541–556, figs. 13*).—This is a developmental and morphological study.

Observations on the effect of environmental conditions on the structure of the lateral roots in sugar beet, E. ARTSCHWAGER (*Jour. Agr. Res.* [*U. S.*], *55 (1937), No. 2, pp. 81–86, pls. 3, fig. 1*).—In this cooperative study by the New Mexico Experiment Station and the U. S. D. A. Bureau of Plant Industry, it was found that under normal conditions the lateral rootlets developed no secondary tissues, and the protoxylem plates were predominantly triarch. The cells of the endodermis often developed secondary thickenings, forming an entire or partly broken thick-walled jacket around the vascular cylinder. If

the thin-walled cells are few in number, they may well be likened to the transfusion cells so common in a thick-walled endodermis.

The preceding crop, while inhibiting early top growth in some plats (noticeably in beets after corn), apparently did not affect root development, e. g., sugar beets from the "after-corn" plat, characterized by less top growth, showed a root system equal to that of the luxuriant "after-cowpea" plat. No significant structural differences were noted in any of the material coming from an apparently normal environment; but distinct pathological changes, especially in the nature of phloem necrosis, were observed in plants grown under unfavorable soil conditions.

Pigmentation in the root of the cotton plant, H. V. Jordan, D. R. Ergle, J. H. Hunter, and J. E. Adams (*Science, 86 (1937), No. 2220, pp. 60–61*).—The use of fertilizers with phosphoric acid dominating tended to accelerate the appearance of *Phymatotrichum omnivorum* root rot, to hasten physiological aging of the plant, and to the development of distinctly reddish pigmentation of the root bark, while high-nitrogen fertilizers tended to the reverse effects on root rot and physiological age and to the development of a pale-yellow tint of the roots, of a lighter shade than control, unfertilized roots.

Studies of the physiology of development and stimulation in cultures of isolated root tips [trans. title], H. Fiedler (*Ztschr. Bot., 30 (1936), No. 9, pp. 385–436, figs. 18*).—Using isolated roots and root tips of maize, peas, and *Vicia faba* growing in nutrient solutions and in agar or quartz sand culture, the author studied regeneration, growth, chlorophyll formation, tropisms, growth-promoting substances, and various biochemical reactions. Comparisons of results are made with those on various plants by other investigators (including a bibliography of 58 entries).

Hydroponics—Crop production in liquid culture media, W. F. Gericke (*Science, 85 (1937), No. 2198, pp. 177, 178*).—This contribution from the University of California gives a general discussion of the growing of crops on a large scale in liquid media. Because the term "aquiculture" has been used in other connections, the author here proposes the name "hydroponics" for this method of commercial growing of vegetables, flowers, etc.

GENETICS

Cytology in its relation to taxonomy, E. Anderson (*Bot. Rev., 3 (1937), No. 7, pp. 335–350, figs. 4*).—This review is concerned with the more recent findings in cytology, which is concerned with the architecture of the germ plasm, and in its relation to taxonomy, which is concerned with the adult forms resulting from germ plasms. It is well known that there are characteristic peculiarities of relationship in different families and genera, the very pattern of evolution varying from group to group. Cytology is important to taxonomy because it is already able to diagnose certain causes of these differences in the pattern of evolution. In fact, it is believed that many groups of flowering plants cannot be adequately monographed without correlated cytological and taxonomic research. The literature references cover more than two pages.

Chromosome structure.—XII, Further radiation experiments with Tradescantia, B. R. Nebel (*Amer. Jour. Bot., 24 (1937), No. 6, pp. 365–372, figs. 7*).—An extension of previous work by the New York State Experiment Station (E. S. R., 77, p. 464). The occurrence of "half-chromatid" lesions in chromosomes of *T. reflexa*, irradiated previously to synapsis, was investigated under varying dosages of X-rays, grenz rays, and gamma rays.

Chromosome structure.—XIII, Meiosis in Dissosteira carolina L., B. R. Nebel and M. L. Ruttle (*Ztschr. Zellforsch. u. Mikros. Anat., 26 (1937), No. 2,*

pp. 281–292, figs. 10).—Continuing this series, the chromosome changes during meiosis in the *D. carolina* are described.

Investigations of the physiology of meiosis, IV [trans. title], K. Zürn (*Ztschr. Bot., 30 (1937), No. 12, pp. 577–603, figs. 10*).—This monographic cytological study was carried out on *Oenothera* spp. and hybrids.

Inheritance of branching habit in gram (Cicer arietinum), V. Ramanatha Ayyar and R. Balasubramaniam (*Madras Agr. Jour., 25 (1937), No. 4, pp. 105, 106, pl. 1*).—The branching habit in the gram was found to be determined by a pair of genes *Br br*, with F_1 showing dominance by basal branching over the umbrella type of plant.

Inheritance of characters in gram (C[icer] arietinum): Foliage colour and rough seed coat, R. Balasubramania Ayyar (*Madras Agr. Jour., 25 (1937), No. 7, pp. 207, 208, pl. 1*).—Green v. pale yellowish green colors of leaves in Bengal gram differ genetically by a single factor pair termed *Lg lg*, and roughness v. smoothness of seed coat by *R r*. *Lg.* is independent of T^a, and *R* is independent of T^a and *P*.

The inheritance of seed-characters in gram (Cicer arietinum L.), H. Singh and R. B. Ekbote (*Indian Jour. Agr. Sci., 6 (1936), No. 5, pp. 1087–1104, pls. 2*).—The inheritance of color, shape, and surface of seed was studied in crosses among Pusa gram types (E. S. R., 66, p. 630) 11, 12, 52, and 21. The bluish brown seed color as in type 11 depended on a single factor *A* or *B*, and the reddish brown seed color of type 12 was produced by interaction of *A* and *B*. *P* modified the action of *A* or *B*, turning bluish brown to yellowish brown as in type 52. The dark reddish brown seed color as in type 21 was determined by interaction of *A*, *P* and *D* or *B*, *P* and *D*. In the three crosses studied bluish brown seed color of the common parent, type 11, behaved as a recessive to reddish brown, yellowish brown, and dark reddish brown of types 12, 52, and 21, respectively. The color, shape, and surface of seed were associated. In group I, the yellowish brown and dark reddish brown color was linked with irregular shape and slightly granulated surface, and in group II the bluish brown was linked with round shape and smooth surface. Flower color also was linked with these seed characters, pink flower being associated with group I with prominent black dots and blue flower with group II, having faint black dots.

Genic analysis of rice.—I, Grain shedding, B. S. Kadam (*Indian Acad. Sci. Proc., 4 (1936), No. 3, Sect. B, pp. 224–229, pl. 1*).—In a cross between the local wild rice which sheds its grain completely and a Burmese nonshedding variety, the shedding character was dominant and attributed to two duplicate genes Sh_1 and Sh_2. See also an earlier note by Ramiah and Rao (E. S. R., 76, p. 610).

Inheritance of inner glume colour in rice, S. K. Mitra and P. M. Ganguli (*Indian Jour. Agr. Sci., 7 (1937), No. 1, pp. 126–133, pls. 2*).—Factors determining inheritance of inner glume color in rice (E. S. R., 59, p. 219) were studied in three crosses. *C* and *L* were held responsible for production of blackish green and light brown, respectively; the presence of both results in green and their total absence in brown in the ratio of 9 green : 3 blackish green : 3 light brown : 1 brown. Black color of the mature inner glume results from the combined effects of B_1 and B_2, while *Y* alone or in combination with either B_1 or B_2 results in yellow. Blackish brown appears in the absence of *Y*. B_1 and B_2 together are dominant over *Y* and *Y* is dominant over either B_1 or B_2, F_2 segregation being in the ratio of 36 black : 21 yellow : 7 blackish brown. The F_3 behavior has also conformed to expected segregations.

Inheritance of sheathed ear in rice, R. L. and B. L. Sethi and T. R. Mehta (*Indian Jour. Agr. Sci., 7 (1937), No. 1, pp. 134–148, pls. 3*).—Sheathed ear, in which an expansion of the rice leaf sheath covers the panicle throughout

the plant's life and keeps the rice fly (*Leptocorisa varicornis*) from the developing kernels, occurs naturally in a group of coarse-grained, unproductive rices called Sathi, but not in good and heavy-yielding rices. In crosses between good rices and a Sathi type, "emerged" condition was dominant in F_1, and in F_2 four phenotypes were distinguishable. Diverse ratios were obtained in F_3, but the data were explained satisfactorily on a trihybrid hypothesis. Certain true-breeding hybrids obtained in F_3 appeared of some economic significance.

Awnedness and its inheritance in rice, R. L. and B. L. SETHI and T. R. MEHTA (*Indian Jour. Agr. Sci., 7 (1937), No. 4, pp. 589–600, pl. 1*).—The variability of the awn and the influence of environment are presented to show that crowding of plants tends to increase awn development. Apparently this is not due to deficient nutrition, because even with heavy fertilization the relation between crowding and awnedness was unaltered. In inheritance awn length was found to be governed by three or more genes acting cumulatively, and awn color was due to a simple gene.

Inheritance of characters in sorghum—the great millet.—IX, Dimpled grains, G. N. R. AYYANGAR, M. A. SANKARA AYYAR, V. PANDURANGA RAO, and A. KUNHIKORAN NAMBIAR (*Indian Jour. Agr. Sci., 6 (1936), No. 4, pp. 938–945, pl. 1, fig. 1*).—This is the ninth number in the series (E. S. R., 76, p. 21).

Dimpling has been noted in white, yellow, red, brown, and pearly or chalky sorghums, although varieties with such kernels are rare. Dimpling can occur in kernels with floury or corneous endosperm, resulting from arrested development of the starch grains. Grains from dimpled varieties are consumed as a delicacy in the dough stage when they are sweet, dimpled kernels containing three times the amount of reducing sugars found in nondimpled kernels. Pollen grains in dimpled sorghum varieties stain light blue and in common varieties deep blue with iodine. In hybrids between dimpled and common nondimpled varieties, gametic dimorphism has been noted in both pollen grains and embryo sacs. Nondimpled kernels in heads with dimpled grains betray xenia. Dimpled kernels occur often in the group *Sorghum cernuum*, and the dimpled variety was named *S. cernuum areolatus*. Dimpled kernels (*dp*) are recessive to normal nondimpled (*Dp*) kernels.

Linkage between purple leaf-sheath colour and juiciness of stalk in sorghum, G. N. R. AYYANGAR, M. A. SANKARA AYYAR, and V. PANDURANGA RAO (*Indian Acad. Sci. Proc., 5 (1937), No. 1, Sect. B, pp. 1–3, pl. 1*).—Linkage was noted between the factor *P* for purple leaf-sheath and *D* for juiciness of stalk, with a recombination percentage of 30±1.8.

The occurrence and inheritance of waxy bloom on sorghum, G. N. R. AYYANGAR, V. PANDURANGA RAO, A. KUNHIKORAN NAMBIAR, and B. W. X. PONNAIAH (*Indian Acad. Sci. Proc., 5 (1937), No. 1, Sect. B, pp. 4–15, pl. 1*).—The waxy bloom developed by all sorghum varieties when heavy is present on the leaf-sheath, leaf-blade, internode, panicle branch, and glume, and when sparse is easily seen at the top of the leaf-sheath and internode and the base of the under surface of the leaf. It differs in groups of sorghums. The heavy bloomed condition (*H*) was found to be a simple dominant to the sparse bloomed (*h*) and independent of leaf-sheath color factors *P* and *Q*, leaf margin disposition factor *Mu*, kernel surface structure factor *Z*, and the brown kernel factors B_1 and B_2.

Chlorophyll deficiencies in sorghum—xantha and patchy albino, G. N. R. AYYANGAR and T. VENKATARAMANA REDDY (*Indian Acad. Sci. Proc., 5 (1937), No. 5, Sect. B, pp. 183–185, pl. 1*).—Two new types of chlorophyll deficiencies, xantha and patchy albinos, both lethal, have been noted in sorghum. Xantha

seedlings are yellow and deficient in green chlorophyll pigment only. A gene designated y_x is responsible for xantha seedlings and Y_x results in normal green seedlings. Patchy albinos, al_p, differ from complete albinos in being greenish in color with patches of albinotic areas; Al_p results in normal green seedlings.

The inheritance of height cum duration in sorghum, G. N. R. Ayyangar, M. A. Sankara Ayyar, and A. Kunhikoran Nambiar (*Madras Agr. Jour., 25 (1937), No. 4, pp. 107–118, pl. 1, fig. 1*).—The character composite "short-early" and "tall-late" in sorghum appeared due to differences in internodal number and disposition in length. In the short group there were about 10 internodes with unimodal distribution in length from the base upwards, and in the tall group about 17 internodes showing bimodal disposition in length. The simple dominant factor In_1 is responsible for production of fewer internodes with unimodal distribution in length, and in_1 gives rise to a greater number of internodes and bimodal distribution in length. Heads of the tall-late plants were heavier, had more whorls, and more branches in each whorl than heads of the short-early group. In_1 was independent of D for pithy stalks.

A preliminary note on a new Saccharum × Sorghum hybrid, E. K. Janaki Ammal and T. S. N. Singh (*Indian Jour. Agr. Sci., 6 (1936), No. 5, pp. 1105, 1106, pls. 2*).—An F_1 of *Saccharum spontaneum* (Dehra Dun, $2n=56$) × *Sorghum durra* ($2n=20$) is described.

Sugarcane-bamboo hybrids, T. S. Venkatraman (*Indian Jour. Agr. Sci., 7 (1937) No. 3, pp. 513, 514, pls. 2*).—F_1 of *Saccharum officinarum* × *Bambusa arundinacea* are reported.

Inheritance of quality and quantity of oil in flax in relation to other plant characters, W. G. McGregor (*Canad. Jour. Res., 15 (1937), No. 8, Sect. C, pp. 362–379*).—The data from 21 varieties of flax grown at the Dominion Central Experimental Farm, 1929, 1931–34, were analyzed statistically at Iowa State College to determine the relations of quantity and quality of oil to seed size, days to maturity, days from flowering to maturity, and plant height. The hybrids Cyprus × Ottawa 770B and Buda × Ottawa 770B were studied to determine the genetic basis for the inheritance of quality of oil, flower type, color of seed and of oil, seed size, and plant height. The refractometric method for determining quantity and quality of oil, compared with the ether extraction method for oil content and the Wijs method for iodine number, was found to be very practical for breeding studies.

High oil content was associated with a long period from blooming to maturity and with large-seeded varieties. In the hybrids, iodine number, seed size, and height of plant apparently depended on several genetic factors; no significant association between oil content, iodine number, seed size, or height of plant was found. Inheritance of flower and seed type was explained on the basis of a single factor, the Ottawa 770B type with white, narrow, involute petal and greenish-yellow seed behaving as a simple recessive or the expression of several very closely linked recessive genes. Association of high iodine number with this factor for yellow seed color was indicated in both hybrids. Evidence suggested that color of oil, as measured by carotenoid pigment content, had a genetic basis. No correlation was indicated between carotene pigment content and the quantity and quality of the oil or color of the seed.

Inheritance of earliness of heading and other characters in a Garnet × Red Fife cross, F. Griffiee (*Sci. Agr., 17 (1937), No. 8, pp. 482–491; Fr. abs., p. 491*).—The F_1 of a cross between the early awnletted, bunt-resistant Garnet and the apical-awned susceptible Red Fife wheat was found to be intermediate in earliness, and F_2 segregation was unimodal in distribution. Action of many

factors governing earliness was evident. Inheritance of bunt resistance was governed by a single main factor; bunt resistance in Garnet wheat was not linked with the awn factors. Awn segregation in F_2 and F_3 was in the dihybrid ratio of 5 awnless : 5 apical owned : 5 awnletted : 1 awned. The parents carried different factors for awnlessness which behaved cumulatively in inhibiting awn expression. Inheritance of earliness and awns appeared independent.

Studies in inheritance and physiology of reproduction in mammals, H. L. Ibsen (*Kansas Sta. Bien. Rpt. 1935–36, pp. 86, 87*).—Brief reference is made to progress in experiments dealing with a suggested case of linkage, inheritance of conformation, and tendency to produce one sex in guinea pigs, and the discovery of modifiers in the horned character and microscopic and chemical study of coat color and pigments in cattle.

A genetic history of the Brown Swiss cattle in the United States, D. M. Yoder and J. L. Lush (*Jour. Heredity, 28 (1937), No. 4, pp. 154–160, figs. 2*).—A study by sampling methods from the Iowa Experiment Station of the pedigrees of Brown Swiss cows in the Register of Production and winners at several leading fairs and livestock shows indicated higher relationships in the show groups than in the production classes. The highest individual relationship to the whole breed was about 9 percent. The amount of inbreeding from 1909–29 was estimated to reduce heterozygosis about 0.5 percent per generation.

Monozygotic triplets in cattle [trans. title], C. Kronacher (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 3, pp. 267–280, figs. 7*).—The similarity of a set of female triplet calves in markings, measurements, weights, blood, and other characteristics suggests their single-egg origin.

X-ray skeletal studies of Dahlem cattle triplets and twins [trans. title], C. Kronacher and F. Hogreve (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 3, pp. 281–294, figs. 13*).—The identity of the triplets described in the above paper and the twins previously described (E. S. R., 77, p. 35) is confirmed by the X-ray pictures of the bones of the legs, including the carpus, tarsus, and lower extremities.

How to breed dogs, L. F. Whitney (*New York: Orange Judd Pub. Co., 1937, pp. XVII+338, [figs. 170]*).—This is an account of reproduction, principles of genetics, and the heredity of known characters in dogs.

Genetics of mouse leukemia, E. C. MacDowell (*Jour. Heredity, 28 (1937), No. 4, pp. 131–138, pl. 1, figs. 6*).—Studies of leukemia in inbred mice and its transmission showed that genetic and environmental factors are both necessary to bring about the optimum development of the disease.

[Genetics and physiology of reproduction studies with poultry at the Kansas Station], D. C. Warren (*Kansas Sta. Bien. Rpt. 1935–36, pp. 77, 78, 85, 86*).—Results are briefly reported on studies showing that both environment and heredity are in part responsible for the occurrence of crooked keel bones; on the production of strains of Rhode Island reds differing in rate and degree of feathering at broiler age; on the influence of various factors on egg formation and variations in the characteristics of spermatozoa from fertile and infertile males; on the production of fertile eggs after artificial insemination of hens that had produced infertile eggs after normal mating; and on the influence of crossing breeds on the weights, egg production, and mortality of the progeny.

A measuring device for shank length of living birds, B. R. Burmester and I. M. Lerner (*Poultry Sci., 16 (1937), No. 4, pp. 211, 212, figs. 2*).—An accurate measuring device for shank length of fowls from hatching to maturity is described from the California Experiment Station. The accuracy of the

instrument was checked with the tarsometatarsal length determined after dissection.

Shank length as a criterion of inherent size, I. M. Lerner (*Poultry Sci., 16 (1937), No. 4, pp. 213–215, fig. 1*).—Measurements at the California Experiment Station of the shank length by the method noted above and the body weight of White Leghorn hens from two different lines and crosses and backcrosses between them showed differences between the groups in shank length that were not evident in the body weight because of its greater variability. The F_1 shank length, although intermediate, approached the longer-boned parent. The backcross shank length approached more closely the shorter parent, suggesting that the F_1 situation was due to heterosis rather than to dominance. There was no evidence of sex linkage for inheritance of shank length in reciprocal crosses.

Applied endocrinology in zootechnic, A. C. Gonzaga (*Philippine Jour. Anim. Indus., 4 (1937), No. 3, pp. 213–223, pl. 1*).—A discussion is given of the role of the endocrine secretions in growth, reproduction, and milk, meat, and egg production.

Studies on the physiology of lactation.—VI, The endocrine influences concerned in the development and function of the mammary gland in the guinea pig, W. O. Nelson (*Amer. Jour. Anat., 60 (1937), No. 3, pp. 341–365, pls. 2*).—Continuing this series (E. S. R., 77, p. 321), observations are presented regarding the influence of preparations of oestrogenic, corpus luteum, and anterior pituitary hormones, singly and in various combinations, on the development of the mammary glands in over 200 male and female guinea pigs. Complete mammary development was induced by oestrone (theelin) in oil with and without progestin, but aqueous solutions were less effective. The cessation of the treatment was followed in normal but not in hypophysectomized animals by lactation. The administration of oestrone with pituitary extract prevented lactation.

Estrus, ovulation, and related phenomena in the ewe, F. F. McKenzie and C. E. Terrill (*Missouri Sta. Res. Bul. 264 (1937), pp. 88, pl. 1, figs. 29*).—Data are presented, portions of which have been previously published, on the occurrence of 1,235 oestrous cycles in 344 Hampshire, Shropshire, Southdown, Rambouillet, and grade ewes. The duration of oestrus ranged from 3 to 73 hr., averaging 29.33 hr. The mean duration of the oestrous cycles was 16.72 days, with the range from 14 to 19 days being considered normal. The rupture of the Graafian follicle after laparotomy occurred in 219 cases. From these observations it was ascertained that ovulation occurs from 12 to 41 hr. after the onset of oestrus. In general, it occurred near the end of the oestrous period and thus was associated with the duration of oestrus. Other relationships between multiple ovulation, size of ova, age of ewes, season, breeding, and plane of nutrition are discussed. The cyclic changes in the histology of the genital tract are described in considerable detail. Oestrus was induced artificially during anoestrus with as little as 520 rat units of Progynon-B, but larger doses were generally required. Ewes kept in continuous oestrus by daily injections of Progynon-B simulated males in behavior. Ovulation was induced in anoestrous ewes with pregnant mare serum in 5 of 11 cases. The time required after injection varied from approximately 36 to 72 hr.

The effect of spaying and theelin injections on body growth and organ weights of the albino rat, O. A. Billeter (*Amer. Jour. Anat., 60 (1937), No. 3, pp. 367–395, figs. 4*).—Although injections of theelin in oil largely prevented the changes in organ weights and sizes which followed spaying, theelin was not a complete substitute for the ovarian secretion. It was suggested that the corpus luteum hormone produced may have a synergistic action on theelin.

The activation of the male sex hormones, I, II, K. Miescher, A. Wettstein, and E. Tschopp (*Biochem. Jour., 30 (1936), No. 11, pp. 1970–1976, figs. 2; pp. 1977–1990, figs. 10*).—Two papers are presented.

I. *The activation of testosterone by the addition of organic acids.*—The activating effect of about 40 carboxylic acids on testosterone was studied. It was concluded that the so-called natural activator probably represents a mixture of acids differing only quantitatively in their activating effects.

II. *The activation of testosterone by esterification.*—In this study a comparison of 11 testosterone esters showed the lowest esters to be the most effective in the capon comb test. In the rat testa, the lower esters proved more effective than testosterone alone; however, higher esters proved more effective when the duration of activity was determined on rats. Considering both rat and capon tests, testosterone propionate showed an especially favorable action. It is recommended that measurements of the male hormone be based on both rat and capon tests, with duration as well as intensity of the effect considered.

The experimental production of intersexuality in the female rat with testosterone, R. R. Greene and A. C. Ivy (*Science, 86 (1937), No. 2226, pp. 200, 201*).—The administration of forms of testosterone to rats during gestation caused a large percentage of resorptions or stillbirths. The 27 males produced were normal, but the 19 females showed varying degrees of intersexuality depending upon the stage of gestation at which the hormone was administered. Attention is called to the relationship of these results to the occurrence of freemartins.

The hormonal influence of prolan on egg production [trans. title], **W. Koch** (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 3, pp. 359–375, figs. 4*).—In several series of experiments the administration intramuscularly of 12.5 rat units of prolan to hens after the laying cycle had practically stopped was found to stimulate egg production consistently above that of the controls.

Improved method of artificial insemination, R. B. Gapuz (*Philippine Jour. Anim. Indus., 4 (1937), No. 3, pp. 233–238*).—This is a description of methods followed in the artificial insemination of mares in the Philippines.

FIELD CROPS

A comparison between actual plat yields and those calculated from grain-straw ratios, J. F. Davis and R. L. Cook (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 265–268, fig. 1; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 50, 51*).—Plat yields of several small grains, calculated from grain-straw ratios, were not significantly different from yields obtained by threshing the entire plat. Indications were that grain-straw ratios may be based on two threshed bundles per plat, although ratios on three threshed bundles gave slightly better results. Since it is advisable to base yields on not less than 20 percent of the plat area, four 6-rod row areas evidently should be harvested from a 1/40-acre plat to derive results as reliable as those calculated from grain-straw ratios or obtained from actual plat yields.

Fertilizer and crop experiments on certain soils of the Black Belt.—A progress report (*Alabama Sta. Circ. 78 (1937), pp. 24, figs. 6*).—Fertilizer experiments were made, 1931–36, on Houston, Sumter, Vaiden, Eutaw, and Lufkin clay soils with alfalfa, barley, velvetbeans, bur-clover, red clover, white clover, sweetclover, corn, cotton, cowpeas, Dallis grass, Kentucky bluegrass, orchard grass, lespedeza, black medic, oats, Austrian winter peas, peanuts, sagrain, sorghum, soybeans, and hairy vetch.

Corn, peanuts, soybeans, sorghum, and Dallis grass were generally suited to all types of soils and appeared to be especially well adapted to conditions in the Black Belt. Oats and alfalfa produced excellent yields on the Sumter soil when properly fertilized, and oats also yielded well on the Vaiden soil. Lespedeza produced excellent crops on the acid Vaiden, Eutaw, and Lufkin soils.

Phosphorus, needed on all soil types for most of the crops tested, should be the most important element of any fertilizer for crops of the Black Belt. Potash was needed on the Sumter soil for most crops, but not on the other soil types except for cotton and sorghum. The acid Vaiden, Eutaw, and Lufkin soils required lime for nearly all crops, and the yield response to lime was especially large when legumes were grown. Nitrogen fertilizers increased the yields of nonlegumes on all soils, but returns from nitrogen were not profitable except with oats on Sumter clay, sorghum and corn on Eutaw clay, and all nonlegumes on the Vaiden and Lufkin clays.

Early (April) planting of the summer crops was very desirable compared with late (June) plantings.

[Field crops experiments in Arizona] (*Arizona Sta. Rpt. 1936, pp. 4, 5, 29–39, 60, 68–71, 78–80, 86, figs. 3*).—Progress results are reported from agronomic research (E. S. R., 76, p. 29) at the station and substations, including variety tests with corn, wheat, barley, oats, grain sorghum, and sorgo; variety-date-of-planting tests with oats, barley, and flax; breeding work with corn, alfalfa, cotton, wheat, and grain sorghum; osmotic pressure and percentage of solids in the cell sap of wheat varieties resistant and susceptible to drought; comparison of open-pollinated and hybrid corn strains; a fertilizer test with alfalfa; studies of certain factors, especially soil moisture and spacing, influencing maturity and length of cotton fibers; study of grade and staple quality of Arizona upland and Pima cotton from representative areas; spacing experiments with Stoneville cotton and border effect with Pima and Acala cotton; studies of physiological factors affecting seed setting in alfalfa; planting tests with grain sorghum and Sudan grass; a comparative test of several types of hotbeds for growing sweetpotato plants; range ecology research concerned with fertilizer tests; and control of annual and perennial weeds by spraying. Cooperation with the U. S. Department of Agriculture continued in several lines of work.

[Field crops research in Kansas, 1934–36], W. H. Metzger, H. E. Myers, R. I. Throckmorton, F. E. Davidson, C. E. Crews, H. H. Laude, J. H. Parker, C. O. Swanson, J. W. Zahnley, A. M. Brunson, C. O. Grandfield, A. E. Aldous, A. L. Clapp, F. J. Zink, C. K. Otis, R. J. Clark, E. C. Miller, A. F. Swanson, F. L. Timmons, D. A. Savage, F. A. Wagner, H. J. Haas, J. B. Kuska, E. H. Coles, and T. B. Stinson (*Kansas Sta. Bien. Rpt. 1935–36, pp. 28, 29, 30, 31–34, 35–50, 51, 52, 53, 54, 121–123, 126, 127, 128, 129, 130, fig. 1*).—Experimentation with field crops (E. S. R., 73, p. 30) for which results are reported on briefly from the station and substations included variety tests with winter and spring wheat, corn, oats, barley, grain sorghum, sorgo, flax, potatoes, soybeans, cowpeas, alfalfa for yield, winter hardiness, and wilt resistance, sweetclover, vetch, and miscellaneous grasses and legumes and forage mixtures; a study of the significance of adaptation with wheat varieties; breeding work with corn for yield and insect resistance, wheat, oats, barley, grain sorghum, sorgo, soybeans, alfalfa, and pasture grasses; inheritance studies of factors affecting quality in wheat, including protein determinations and dough-ball time and recording mixer tests on nursery-grown varieties and hybrids; cultural (including planting) experiments with sweetclover, wheat, grain sorghum, flax,

soybeans, potatoes, alfalfa, Sudan grass, and buffalo grass; comparison of seedbed preparations for wheat, flax, alfalfa, and Sudan grass; fertilizer tests with wheat, bluegrass, and potatoes, and liming trials with sweetclover; fall planting of sweetclover for seed production; fertilized, irrigated, and ordinary crop rotations; injury to corn on soils fertilized with ammonium sulfate; cold resistance studies with wheat, rye, oats, and barley; a quantitative study of the component parts of the plant in several varieties of sorghum representing widely different types of growth; root reserves in alfalfa in relation to the time of fall cutting; the influence of the method of harvesting and baling alfalfa hay upon quality; moisture equilibrium studies on grain sorghums; a study of lateral and vertical root development of Dwarf Yellow milo in variously spaced rows; a physiological study of the hard winter wheat plant; factors influencing the quality of wheat during farm storage; wheat investigations, including studies of milling and baking quality as affected by variety, and effects of time of seeding, nitrogen fertilizers, and previous alfalfa on yield and protein content of wheat; pasture improvement work, including management of livestock and effect of burning on bluestem pastures, eradication of undesirable plants, and effects of various clippings (stimulating grazing) and of fertilizers on yield, vigor, and succession of pasture vegetation; seed production studies with bluestem grasses and their growth under irrigation; drought injury to native pasture grasses and their reestablishment by contour listing and other practices; pasture tests with sweetclover varieties and mixtures of cultivated grasses; and weed control studies, including methods of killing bindweed with chlorate and other practices, and studies of root reserves. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops research in New Hampshire] (*New Hampshire Sta. Bul. 296 (1937), pp. 5, 6, 7, 10–12, 13, 14*).—Agronomic studies briefly reviewed (E. S. R., 75, p. 474) and variously participated in by M. F. Abell, S. Dunn, F. S. Prince, P. T. Blood, T. G. Phillips, G. P. Percival, and L. J. Higgins included experiments with hay and with legumes on neglected hay lands; a dairy farm rotation on worn-out hay lands; potatoes in a 3-yr. fertilized rotation; fertilizer placement experiments with potatoes; a silage corn variety test; a fertilizer experiment with legumes in the Connecticut Valley; a time of cutting hay test; a top-dressing experiment on old pastures and meadows; and an economic pasture study.

Twenty-one years of crop yields from Cottonwood Experiment Farm, A. N. HUME, E. JOY, and C. FRANZKE (*South Dakota Sta. Bul. 312 (1937), pp. 79, figs. 11*).—Yields secured at the Cottonwood Substation, 1912–32, are tabulated for wheat, oats, barley, flax, and rye, cultivated crops of corn and sorghum for grain and forage, and for alfalfa and sweetclover grown in various crop sequences; for alfalfa varieties seeded in different ways and flax sown at several dates; and for potatoes, sunflowers, various forage grasses, and varieties of sugar beets, mangels, turnips, carrots, and rutabagas. The merits of manure v. no manure, legumes plowed under for green manure v. cut for hay, and fall plowing 10 in. v. 5 in. deep, as affecting yields of different crops, also are discussed. The highest estimated gross cash returns from the several crops, made in rotations indicated, are shown in comparison. Environmental conditions, soils, and crop varieties used are also described briefly.

As at Highmore (E. S. R., 70, p. 36), the most effective crop sequence has included a cultivated crop, a small grain, and a legume in order. Many modifications of this system are available. When small grains and flax were worth producing, the yields were made after cultivated sorghum or corn, whereas

yields were not worth while with continuous small grain. The highest yields and returns from staple crops were obtained in short rotations including wheat.

Irrigated crop rotations at the Huntley (Mont.) Field Station, 1912–35, S. H. Hastings and D. Hansen (*U. S. Dept. Agr., Tech. Bul. 571 (1937), pp. 38, figs. 7*).—Crop yields obtained in irrigated rotations at the Huntley, Mont., Substation, 1927–35, are reported in detail and results summarized for 1912–35, computed on the basis of four 6-yr. periods, and supplementing a report (E. S. R., 62, p. 128) covering 1912–26. Environmental conditions and technic are described.

Annual 1927–35 yield fluctuations, expressed as percentages of mean yields of all plats, 1927–35, ranged from 114 percent in 1932 to 78 percent in 1934.

Sugar beet yields for the latter half of the 24 yr. were not maintained more satisfactorily in 2- and 3-yr. rotations than under continuous cropping. The greatest yield increases resulted from applications of manure. Yields from rotations including 2 yr. of alfalfa were materially less than mean yields from all rotations, particularly for the last 6 yr. For the first three periods, beet yields from rotations including 3 yr. of alfalfa averaged above the means of all rotations, but declined markedly since 1930. However, creditable beet yields came from alfalfa and sweetclover rotations, which include harvesting certain crops with livestock. On the contrary, potato yields were stimulated more by inclusion of alfalfa in rotations than by applications of manure, and 3 yr. of alfalfa proved a better farm practice than 2 yr. The percentages of marketable tubers decreased as yields were reduced in the different rotations.

Oats made its lowest yields from continuous oats, an oats-wheat rotation, and a 2-yr. rotation which included oats (rye) and potatoes. Manure stimulated oats yields, but not to the extent as in rotations including alfalfa. Corn yields declined under continuous cropping but not materially in two untreated 2- and 3-yr. rotations. Relatively satisfactory corn yields came from manured rotations and from those with crops harvested by livestock. Very low wheat yields resulted from continuous wheat and wheat in a 2-yr. rotation with oats as compared with certain other cropping programs.

Flax when cropped continuously, 1930–35, averaged only 4.8 bu. per acre but made 24.8 bu. in a 6-yr. alfalfa rotation. Yields of Great Northern field beans were maintained satisfactorily, 1927–35, under continuous cropping and also reflected the value of manuring in a 3-yr. rotation. Alfalfa made its highest mean yields, 1912–35, from the second- and third-year growths in a manured rotation.

Comparative values of the different rotations, as determined, show that reasonably satisfactory net returns may be expected for a few years from certain untreated rotations, but such practices cannot be continued long without material reduction in the per-acre returns. The most pronounced benefits as net returns resulted from manuring or in rotations, including pasturing. With judicious choice of crops and adoption of the better farm practices used in these rotations, creditable net per-acre returns may be expected.

Irrigation requirements of cotton and grain sorghum in the Wichita Valley of Texas, C. H. McDowell (*Texas Sta. Bul. 543 (1937), pp. 32, figs. 16*).—Experiments on Miller loam soil, 1932–36, at Iowa Park were made to determine irrigation requirements of cotton and grain sorghum (hegari), using irrigation rates ranging from 2 to 34 acre-in.

The highest average yield (lint) of cotton resulted from use of 30 acre-in. of water, which included both irrigation and rainfall during the growing season. The yield declined as the amount of water varied from 30 in., although good yields were obtained within the range of from 28 to 32 acre-in. About

38 to 39 acre-in. appeared to be optimum for grain sorghum under conditions in the valley, although good yields (grain) were obtained from amounts of water ranging from 32 to 39 in.

Results obtained with both crops indicated that the total amount of water required for maximum yields is influenced by seasonal conditions, including amount and distribution of rainfall, humidity, and temperature. In general, these crops seem to need more water in dry, hot years than in more favorable years.

The effect of injury in imitation of hail damage on the development of small grain, J. C. ELDREDGE (*Iowa Sta. Res. Bul. 219 (1937), pp. 281–302, figs. 11*).—Oats, barley, and winter wheat were subjected to five types of injury at weekly intervals from May 11 to July 6, 1930–32. The complete destruction of above-ground parts, as by a severe hailstorm, increased the percentage of injury from 10 for oats, 43 for barley, and 70 for wheat on May 11 to total loss for oats on June 15, barley on June 8, and wheat on June 1. Cutting off all leaves above the growing point, similar to close grazing by horses or sheep but more severe than the closest early grazing, reduced yields about in proportion to the percentage of leaf area removed at each weekly interval. When cereals were whipped severely enough to break all plants, to simulate a medium severe hailstorm, the percentage of injury for oats rose from 10 percent on May 11 to 69 on June 15, for barley from 22 to 72, and for wheat from 25 to 77 percent, respectively.

Bruising the developing heads before emergence, simulating effects of a hailstone striking the head while still in the boot or just emerging, reduced oats yield 10 percent on June 8, 8 on June 15, and 10 on June 22; barley yields 25 on June 8, 10 on June 15, and 51 on June 22; and wheat yields 9 on May 25, 10 on June 1, 13 on June 8, and 20 percent on June 15. Such injury apparently increased the amount of sterile spikelets, but was not the sole cause of this condition. Breaking stems about the middle so that the heads hung straight down reduced yields progressively less from early June until the grain was mature. Yields of oats were reduced from 47 percent on June 8 to 12 on July 6, of barley 50 and 11, respectively, and of wheat from 44 on June 1 to 8 percent on June 29.

See also a report on simulated hail damage to corn (E. S. R., 73, p. 775).

Cotton variety tests of 1934 and 1935, L. M. HUMPHREY (*Arkansas Sta. Bul. 344 (1937), pp. 32*).—In 12 cotton variety and strain tests conducted at the Cotton Substation in 1934 and 1935, 10 Arkansas Acala strains, 13 Arkansas Rowden strains, Roldo Rowden 40-2-9, 3 Stoneville strains, 2 D. & P. L. strains, 2 Delfos, and Dixie Triumph 6 were consistently among the better producers. The group of varieties and strains consistently making poor showings included Mars Rose, Trice 730, Wilson Type Big Boll, Farm Relief 2, 3 Missdels, Kekchi, Coker Foster 6, Foster 581, Delpress 3, Cliett 711, Sweepstakes 3008, Northern Star, Delfos 3010, 3 Arkansas Rowden strains, and 3 Arkansas Acala strains.

Variance analyses indicated that varietal differences were of great importance in determining performance. Soil variations, as indicated by series and locations in the variance studies, made large contributions to total variation, often surpassing contributions by varietal differences. In combined analyses, including seasonal and location variations, seasons contributed most to the variance.

Competition between cotton varieties: A reply, B. G. CHRISTIDIS (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 703–705*).—Comment on the conclusions of Quinby et al. (E. S. R., 77, p. 619).

Fertilizer experiments with cotton in type-of-farming areas, M. NELSON (*Arkansas Sta. Bul. 346 (1937), pp. 31, fig. 1*).—Recommendations for the ferti-

lization of cotton are made for each of 11 of the 12 type-of-farming areas in Arkansas on the basis of results secured in 545 prolonged cooperative fertilizer tests. The responses to fertilizer and its economy are shown for each area.

With proper adjustments, it was concluded, fertilizers may be used with profit in all parts of Arkansas. While a complete fertilizer is always desirable, moderate applications usually lead to the best returns from fertilizers. Both nitrogen and phosphorus evidently should be included in all fertilizer applications unless nitrogen is supplied indirectly. Side dressings with nitrogen may yield high returns in some areas, but nitrogen used alone may best be applied before planting. Side dressings with nitrogen, while not the best means of realizing returns from fertilizers, are most effective when preceded by a moderate application of complete fertilizer.

A simple method of self-pollinating cotton flowers, H. C. McNamara (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 706, 707, fig. 1*).—The method of selfing cotton flowers here described seemed to be reasonably safe and took less time than other methods tried. By this method a small merchandise marking tag, strung with a 7-in. double strand of 28-gage copper wire, is looped around the boll pedicel and the wire coiled loosely around the unopened corolla and somewhat more tightly around the top of the corolla.

Certain characters of cotton fiber as affected by plat placement, G. N. Stroman (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 638–643*).—From an analysis of variance made at the New Mexico Experiment Station on 8 random check rows of 10 plants each of College Acala in 1933, 7 rows in 1934, and 10 rows in 1935, the significant mean squares in the source of variation of the between means of rows seemed to indicate that certain qualities of lint, as especially denoted by length of lint and percentage 1⅛-plus fibers, were affected by the placement of plats. Such variation seemed due to ununiformity of the soil. Relationships of the characters as shown by the correlation coefficient of different sources of variation seemed to change to some degree as the characters themselves were affected.

Variety and inter-cultural experiments with cowpeas, C. K. McClelland (*Arkansas Sta. Bul. 348 (1937), pp. 15*).—The better cowpeas for hay production, as shown by combined results of variety tests, 1926–36, at the station and Fruit and Truck Substation, included Clay, Groit, Iron, Victor, Brabham, Whippoorwill, and Taylor. In seed production, Holstein, Large Blackeye, Groit, Brown Sugar Crowder, Arlington, and New Era are varietal leaders. The greatest increase in a succeeding crop, according to results with oats at the station and with cotton at the Cotton Substation and at Scott field, follows cowpeas that were planted in the same row and at the same time as the corn.

Experimental studies of the physiology and nutrition of flax with reference to the production of fiber and oil.—I, Pot experiments [trans. title], K. Schmalfuss (*Bodenk. u. Pflanzenernähr., 1 (1936), No. 1–2, pp. 1–39, figs. 13*).—The author reports results relative to the effects of various nutrients and mineral-salt ions on the quality of the bast fibers and of the flaxseed oil.

Natural cross-pollination studies in fiber flax, B. B. Robinson (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 644–649*).—More natural crossing in flax was observed on blue-blossom varieties than on white-blossom varieties, and more occurred in Michigan than in Oregon during studies by the Oregon Experiment Station and the U. S. D. A. Bureau of Plant Industry. Total crossing within and without the same flax might amount to 5 or 6 percent in Michigan and from 1 to 2 percent in Oregon, possibly due to climatic conditions. Bagging of selections or space isolations as well as intensive roguing are indicated as methods of attacking the problem.

Should flax be grown in Utah, R. W. Woodward, D. C. Tingey, and A. C. Dillman (*Utah Sta. Bul. 278 (1937), pp. 12, fig. 1*).—Flax experiments in cooperation with the U. S. D. A. Bureau of Plant Industry, 1931–36, included tests in different localities in Utah of five varieties for seed production in comparison with wheat, oats, and barley, and studies at Logan on effects of late irrigation and time of harvest on yields. The oil content and iodine number of oil from Rio, Bison, Linota, and Redwing flax, 1932–36, were determined by T. H. Hopper, of the North Dakota Experiment Station.

Bison led with an average for all tests of 21.8 bu. of seed per acre, and Rio made 20.8 bu., Linota 20.5, Buda 20.4, and Redwing 18.7 bu. Average yields at Logan were substantially higher, with Rio slightly surpassing Bison. Bison, because of consistently high seed production, favorable yield of oil, good quality, and high resistance to flax wilt, is deemed the best variety for Utah conditions.

When flax grown under irrigation at Logan was harvested at three dates, average increases in yield of the five varieties on September 1 and October 1 over August 1 were 4.6 and 15.5 percent, respectively, Rio and Bison showing the greatest increases. This yield increase resulted from a longer period of blooming, or a second period of bloom, which matured seed after the first harvest, when irrigation water was supplied often enough to keep the plants growing.

Comparing acre yields of small grain grown under similar conditions in the same fields with flax and calculated prices, it was found that in average gross acre returns wheat, barley, and oats exceeded flax by 32, 49, and 20 percent, respectively. On the basis of yield ratios in bushels the flax grower must receive 3 times the price per bushel of wheat, 4.5 times the price per bushel of barley, and 5 times the price per bushel of oats for equal gross returns.

Experiments on the planting distance in varietal trials with millet, Setaria italica (L) Beauv., H. W. Li and C. J. Meng (*Jour. Amer. Soc. Agron., 29 (1937), No. 7, pp. 577–583, fig. 1*).—Results obtained in a repetition of spacing experiments (E. S. R., 74, p. 629) with a tillering and a nontillering variety of millet indicated that, in varietal trials with millet, the closer plants are set in the row the higher will be the yield in that row, no matter which type is involved. To compensate for advantages possessed by tillering millets in the case of wider spacings or with missing hills, the authors suggest close spacing in the rows, i. e., 2 in. apart for best results in varietal trials.

Plot and plant variation in Virginia peanuts, J. H. Beattie, V. R. Boswell, and E. T. Batten (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 586–589*).—The following conclusions and suggestions were drawn from 5 years' observations of plat and plant variation with the Jumbo Runner type of peanut under conditions characteristic of good commercial practice, made cooperatively by the U. S. Department of Agriculture and the Virginia Experiment Station.

A satisfactory and practicable size of plat is 300 sq. ft., consisting of a single 100-ft. row, but preferably five or six 20-ft. rows from 2.5 to 3 ft. apart. Competition is pronounced in Jumbo Runner peanuts planted 1 ft. apart in the row. Variations in spacing from an average of 9 in. to 15 in. under good conditions of culture and fertility have not produced significant differences in yield per plat. The high degree of competition accompanying close planting tends to produce a higher variation among the plants in a single plat when closely planted than if more space per plant is available. In detailed studies involving small numbers of plants in which the lowest variation reasonably obtainable among plants is important, spacing from 18 to 20 in. in the row is indicated as preferable to from 10 to 12 in. This is not a recommendation for com-

mercial practice. The best commercial stocks (probably pure lines) exhibit yield variations not significantly greater than certain known pure lines. Plats of 300 sq. ft. under reasonably good field conditions may normally be expected to show a noncorrelated variation of about 10 percent. The coefficient of variability of single plant yield in very small plats (one 20-ft. row) with plants 1 ft. apart or closer is very high, generally between 40 and 80 percent, but sometimes higher. In 100-ft. rows this variability in these studies was less extreme. Wider spacing tends to reduce plant yield variability.

Germination of seeds of the potato as affected by temperature, H. L. Stier and H. B. Cordner (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 430–432*).—One-year-old potato seeds in a study at the Maryland Experiment Station failed to germinate at 0°, 5°, and 35° C., and at 30° only 1 percent germinated after 45 days. Between 15° and 25° the percentage germination was uniformly high, from 89 to 91, while at 10° it was significantly lower. The rate of germination was most rapid at 20°.

Delayed germination in seeds of the potato, H. L. Stier (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 433–435*).—In additional experiments at the Maryland Experiment Station, seeds of the potato were observed to exhibit delayed germination until from 4 to 5 mo. after harvest. Results of certain storage, chemical, and mechanical seed treatments indicated that the embryo is not in a state of rest, but that delayed germination is caused by some tissue or agency exterior to the embryo.

Soil reaction, available nutrients, and composition of the potato plant, O. Smith and L. B. Nash (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 445–448*).—Data from the soil and plants of 4 of the 30 plats of a soil reaction experiment (E. S. R., 75, p. 771; 77, p. 42) at Cornell University are reviewed. The soil of the 4 plats was a silty clay loam, with reactions in 1936 of pH 4.74, 5.65, 6.85, and 7.92. The number of tubers set, size of tubers, and yields have been markedly reduced when grown in the more alkaline soils in comparison with the less alkaline or acid soils. The reduction might be attributed to deficiency in available manganese and potassium, especially under conditions of heavy liming or high pH.

The significance of pre-emergence soil moisture to yield of potatoes on dry land in the western high plains area, H. O. Werner (*Amer. Potato Jour., 14 (1937), No. 6, pp. 189–195; abs. in Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 432*).—In the high plains area in western Nebraska, precipitation prior to planting or at least before emergence of main season plantings of potatoes has been a more significant factor in production of satisfactory yields than rainfall during the crop season. Data secured, 1932–36, from potatoes in rotations at the Box Butte Farm, of the Nebraska Experiment Station, show their response to pre-emergence and summer rainfall and ability to produce a crop from stored moisture. Satisfactory yields were produced with only the soil moisture stored before emergence of the plants. In years of low rainfall, potatoes have practically failed when planted after small grain because of serious depletion of soil moisture as deep as the fifth foot. Potato yields after corn were fairly good since corn removed very little moisture below the third foot, and the best potato yields were after summer fallow. During summers of little rainfall, potatoes removed practically all available moisture from the upper 5 ft. of soil.

The influence of planting date on the yield, quality, and development of the Russet Burbank potato (a preliminary report), C. H. Metzger (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 437–443, fig. 1*).—Progress results are reported from the first year of a Colorado Experiment Station experiment in which Russet Burbank potatoes were planted at the Mountain Substation on

May 4, 11, 18, and 25, and June 1, 8, and 15, 1936. Data are given on yield, starch and dry matter, shape and appearance of tubers, rate of tuber development, tuber set, vine development, and ratio of tubers to vines.

A study of factors concerned with rice growth, L. C. Kapp (*Arkansas Sta. Bul. 349 (1937), pp. 21, figs. 2*).—Effects of soil reaction, applications of various commercial fertilizers, and soil structure on the growth, yield of rice, grain, straw, and roots, and sterility produced were studied on four different soils, i. e., Clarksville silt loam of pH 4.4 and 5.6, a cropped rice soil, and a virgin Crowley soil.

Seedling growth of rice and grain yields from cropped rice soil treated with increasing amounts of acid rose to a maximum and then decreased as the applications were further increased. Moderate applications, from 100 to 200 lb. per acre, of both acidic and basic nitrogenous fertilizers were effective in increasing growth and yield of rice, providing soil reaction was controlled. On the cropped rice soil the optimum reaction for high rice yields in jars under greenhouse conditions was near pH 6.5.

On very acid soils, sterility was controlled partially by the addition of calcareous carbonate and calcium chloride. As the cropped rice soil acidity increased over the best grain-producing acid treatment, sterility increased and yields declined. The reaction of the soil solutions and amount of soluble calcium present per jar were not related directly to rice growth, yield, and sterility on the four soils, indicating that other factors, depending on reaction either in the soil or plant, were operative in affecting yields. The structure of the three variously treated soils was not related closely to sterility or yields produced, nor was the production of the few large roots correlated with a large percentage of sterility.

Nutrient solution studies indicated that atmospheric concentrations above 0.1 may be excessive for rice and are associated with unnatural conditions. Too acid a reaction, pH 4, tends to depress root growth and rice yields and to increase the sterility, this being true also in soil cultures. Manganese in nutrient solutions decreased rice growth and increased the percentage of sterility in proportion to the amount added. Iron in the same nutrient solution at the same rate as manganese was not so effective.

The relation of organic matter and fertilizer to the growth and composition of rice, M. B. Sturgis and J. F. Reed (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 360–366*).—The relation of additions of nitrogenous organic matter (ground soybean plants), fertilizer salts, lime, and sulfur to the yield, protein, and ash constituents of Blue Rose rice grown in Crowley soils was studied at the Louisiana Experiment Station.

Addition of nitrogen to deflocculated Crowley silt loam increased the protein percentage in the rice heads and the yield of rice. A relatively large amount of nitrogen in a virgin Crowley soil was found associated with a high protein content in the rice. Application of phosphorus to a soil deficient in this element resulted in a greater rice yield and a higher phosphorus content on the percentage basis. The comparatively higher amount of phosphorus in virgin Crowley silt loam was reflected by a higher rice yield and a high phosphorus percentage in the rice heads. Use of potassium salts as fertilizer seemed to balance the effects of excess amounts of lime and sulfur in their tendencies to cause the production of an abnormal proportion of straw. Indications were that the absorption and translocation of phosphorus by the rice plant do not necessarily depend upon absorption and movement of magnesium.

Rice grown on alkaline soil containing considerable soluble and colloidal silica absorbed unusually large amounts of silica. The silica content of the

straw greatly exceeded that of the heads. Silicon was not substituted for phosphorus as a nutrient in rice growth. The iron content of both heads and straw was found to be high. The soil solution of the flooded soil was high in soluble iron existing largely in the ferrous state.

Soybeans for grain, H. B. Sprague (*New Jersey Stas. Circ. 373 (1937), pp. 4, fig. 1*).—Practices deemed suitable for growing and harvesting soybeans for grain in New Jersey are outlined, with remarks on the place of the crop in the rotation and the use of soybeans for livestock. Harbinsoy is indicated as the most productive grain variety available and also as a good hay and green manure soybean with ability to compete with weeds and to endure drought.

The influence of fertilizers upon the yield and starch content of the Triumph sweetpotato, W. S. Anderson (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 449, 450*).—Fertilizer experiments with sweetpotatoes at Laurel, Miss., by the Mississippi Experiment Station on Ruston, Orangeburg, and Cahaba fine sandy loams revealed a number of yield differences in response to several formulas. In tests of the rates of from 400 to 2,000 lb. of 4–8–4, significant differences in yield were obtained between the 400 or 500 lb. and the higher applications in all cases except on the fertile Orangeburg land. There was no effect by fertilizers upon the length/diameter ratio of the roots, although Orangeburg soil, which is more retentive of moisture, produced more chunky roots, regardless of fertilizer used, than the other soils. Although there were variations in starch content of roots produced on the different fields and even among treatments within each field, fertilizers apparently had no effect upon starch content.

Grade and shape of sweetpotatoes in response to potash in South Carolina, V. R. Boswell and J. H. Beattie (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 451–455*).—In cooperative experiments by the U. S. D. A. Bureau of Plant Industry and the South Carolina Experiment Station, made at Florence from 1929–35, the Porto Rico, Nancy Hall, and Big Stem Jersey sweetpotatoes received applications of 75 lb. v. 15 lb. per acre of K_2O (500 lb. of 3–8–15 v. 3–8–3) on Norfolk fine sandy loam. Under the conditions, increasing the potash content of the fertilizer from 3 to 15 percent had no important effect on total yield, yield of No. 1 grade, or on the shape of sweetpotatoes, but slightly increased the size of roots.

Bound water and electrical conductivity as measures of cold resistance in winter wheat, C. A. Van Doren (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 392–402, figs. 3*).—The relation of free water, the amount frozen at −20° C., and of bound water, the amount unfrozen at −20°, to cold resistance of winter wheat was studied at the Illinois Experiment Station. Specific conductivity of water extracts of frozen and subsequently thawed tissue served as a measure of soluble minerals released from the cells as a result of injury by freezing.

Low total water, low free water, and high bound water of leaves of field-grown winter wheat varieties were not related consistently to their known resistance to low temperatures. However, leaves from Minhardi, a hardy variety, contained less total and less free water than leaves from the less hardy Blackhull. No consistent differences in bound water were found even in leaves of Minhardi and Blackhull. Total water in leaves from these wheats grown in the greenhouse was greater in plants in a soil of high fertility than in low fertility soil, but differences between amounts of free and bound water were not consistent.

The crown tissue of winter wheat varieties evidently should receive more consideration than leaf tissue in testing cold resistance of winter wheat varieties. Soluble minerals measured by electrical conductivity in water extracts

of frozen leaves from these wheats were greater than in water extracts from frozen crowns, indicating greater injury to leaves from freezing at −20°. Amounts of total and free water in both varieties were also greater in the crowns than in leaves. More than twice as much bound water occurred in crowns as in leaves of Minhardi, while the reverse relation was found in Blackhull. Greater cold injury to both leaf and crown tissue when exposed at −20° was found in Blackhull than in Minhardi. Total and free water content both of Minhardi and Blackhull leaves were increased by washing. The bound water content of Minhardi increased slightly more than that of Blackhull through increased hydration of tissues from washing.

Chemical treatments helpful in germination tests of seeds, W. Crosier, S. Patrick, and L. Taylor (*Phytopathology, 27 (1937), No. 7, pp. 797, 798, fig. 1*).—In tests over a 5-yr. period by the New York State Experiment Station, five organic mercurials have proved effective in inhibiting fungus development on germinating seeds of small grains, corn, beans, peas, and other large seeded plants, and usually higher percentages of normal sprouts have developed than in nontreated controls. With the possible exception of copper oxalate and diluted cuprous oxide, materials other than the organic mercurials have not proved satisfactory. The mercurials may be applied either as dusts or dips.

Vital staining as a method of determining the viability of seeds [trans. title], B. L. Isachenko (Issatschenko) and A. A. Predtechenskaiâ (Predtetschenskaja) (*Trudy Bot. Inst. Akad. Nauk SSSR, Èksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2 (1936), pp. 347–379, figs. 5; Ger. abs., pp. 376, 377*).—It is claimed that by staining seeds with various dyes by the method described living embryos can be distinguished from nonliving. The practical applications and theoretical aspects of the method are discussed.

The drouth resistance of quack grass under various degrees of fertilization with nitrogen, S. T. Dexter (*Jour. Amer. Soc. Agron., 29 (1937), No. 7, pp. 568–576, figs. 3*).—The rhizomes of quackgrass from plants grown by the Michigan Experiment Station in plats fertilized with ammonium sulfate sprouted more vigorously and were less able to recover in soil after sprouting than similarly treated rhizomes from unfertilized soil. Marked differences were not apparent in drought resistance of rhizomes from either source. Rhizomes from fertilized plants were more susceptible to molds than rhizomes from unfertilized plants, particularly if injured somewhat by drying in the air. A period of sprouting before exposure to drought was more injurious to rhizomes from fertilized soil.

HORTICULTURE

[Horticultural studies by the Arizona Station] (*Arizona Sta. Rpt. 1936, pp. 5, 6, 52–59, 60–63, fig. 1*).—Among studies, the results of which are discussed, are factors relating to the blossoming and maturity of dates; the protection of dates from rain damage; leaf growth of different varieties of date palms; storage of dates; varieties and culture of bush fruits, particularly blackberries and dewberries; fertilizer requirements of lettuce; nut filling and maturation and relation of vegetative vigor to blossoming in the pecan; causes of premature dropping of pecans; and the fertilizer requirements of the Washington Navel orange and Marsh grapefruit.

[Horticultural studies by the Kansas Station], R. I. Throckmorton, R. J. Barnett, L. E. Melchers, G. A. Dean, E. Abmeyer, W. F. Pickett, G. A. Filinger, W. B. Balch, and F. P. Eshbaugh (*Kansas Sta. Bien. Rpt. 1935–36, pp. 34, 35, 55–59, 124, 125*).—The results are presented of cultural and pruning experi-

ments with apples; mulching studies with strawberries; pruning of sour cherries; variety and cultural tests of various fruits, rootstocks, and grapes; the heating of hotbeds; the growing of plants with artificial light; the relation of leaf structure to the rate of photosynthesis in apples; and the growing of forest nursery stocks, ornamentals, and shrubs.

[Horticultural studies by the New Hampshire Station] (*New Hampshire Sta. Bul. 296 (1937), pp. 24-29*).—Brief reports are included on studies of fruit formation in the apple, by G. F. Potter; pollination of McIntosh and related varieties of apple, by L. P. Latimer; pruning of the apple, by Potter; variety tests of grapes, raspberries, plums, and cherries, by Latimer; fertilizer requirements of the apple, by Potter and G. P. Percival; fertilizer needs of the strawberry, by Latimer; variety tests with sweet corn and tomatoes, by J. R. Hepler; and fertilizer requirements of the peach, by Potter.

Further tests of vegetable varieties for the winter garden region, L. R. Hawthorn (*Texas Sta. Bul. 546 (1937), pp. 43, figs. 6*).—This supplements an earlier publication (*E. S. R., 74, p. 338*) by reporting on the adaptability of certain vegetable varieties introduced since the conclusion of the earlier work. In this paper an account is given of 169 varietal names representing 9 vegetables—dwarf lima beans, sweet corn, edible cowpeas, cucumbers, muskmelons, rutabagas, tomatoes, turnips, and watermelons. Special consideration is given to the matter of earworm resistance in sweet corn and to temperature and time of ripening in muskmelons.

Fertilizer placement on lima beans in Maryland, W. A. Frazier (*Natl. Joint Com. Fert. Appl. Proc., 12 (1936), p. 116*).—In a study conducted by the Maryland Experiment Station on the Eastern Shore, 448 lb. per acre of a 3-10-8 fertilizer placed by the side of the rows gave heavier yields than did 800 lb. of the same material broadcast. There was indicated a need for a higher content of nitrogen than was present in the 3-10-8 fertilizer.

The connexion between the keeping qualities of commercial varieties of onions and the rates of water loss during storage, R. M. Woodman and H. R. Barnell (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 219-235, figs. 2*).—Studies at Cambridge University upon several varieties of onions, including Unwin Reliance, White Spanish, Sutton A 1, Ailsa Craig, Giant Rocca, Flat Madeira, and White Lisbon, indicated an association between high relative rates of water loss and high total water losses, and high total water losses and inferior keeping quality. This correlation was particularly evident in the period immediately succeeding harvest and is thought to be of value in determining the comparative keeping quality of onions without actual storage tests.

A new maturity test of peas, S. L. Jodidi (*Jour. Franklin Inst., 223 (1937), No. 5, pp. 593-607, figs. 4*).—A description is presented of a maturity test, developed by the U. S. Department of Agriculture, based on specific gravity and in turn on the principle that younger tissues contain, as a rule, higher percentages of water and lower percentages of dry matter. Leaving out of consideration the reducing sugars, whose quantities are so small as to be negligible, it was observed that sucrose percentage was directly proportional to water content and inversely proportional to dry-matter content. The reverse was true in the case of starch.

Studies on the inheritance and development of fruit size and shape in the tomato, A. F. Yeager (*Jour. Agr. Res. [U. S.], 55 (1937), No. 2, pp. 141-152, figs. 2*).—A genetic study carried on over 6 yr. at the North Dakota Experiment Station with tomato varieties and seedlings differing sharply in certain characters, such as size, shape, and number of locules in the fruit, led to the general conclusion that the inheritance of size and shape is a complex proposition

governed not only by genetic but environmental factors. There was observed a high degree of association between locule number, size, and shape, and an association between qualitative first-chromosome factors and locule number. Locule number was found to segregate in a ratio of 3:1 of few- to many-loculed plants in the F_2 population, and in a ratio of 1:1 in backcrosses, the dominant group carrying 2–3 locules and the recessive group 3.5 and more locules. Correlations between the ovary and the fruit again showed that with most varieties, size and shape of fruit are predictable at blossoming time. Some evidence was obtained that pear shape in the tomato is probably induced by the constricting effect of the fused corolla tube.

Growth and fruiting responses to pruning and defloration of tomato plants, V. M. WATTS (*Arkansas Sta. Bul. 347 (1937), pp. 16, figs. 2*).—Continuing investigations with the tomato (E. S. R., 70, p. 46), Marglobe plants grown under controlled conditions in the station greenhouses and subjected to different pruning and defloration treatments were carefully studied as to effects on vigor, commencement of fruiting, size of fruit, yield, etc.

As applied to plants of moderate vigor, pruning increased the average size of fruits but failed to advance the date of the first fruit harvest or to increase the weights of the early harvests. Since the length of the harvest periods was limited, the total yields were not influenced consistently. The removal of late clusters of flowers resulted in increased early and total yields and increased the size of fruits, but did not advance the date of the first harvest. Vegetative vigor was also increased by partial defloration. Pruning increased the size of individual leaves and the blades were thicker, with a tendency to curl.

Interpreting the results from the standpoint of the outdoor growth, the author suggests that pruning either by training to a single stem or heading the plants could not be expected to be profitable from the viewpoint of increased early yields or advancing first maturity. On the other hand, where size of fruit is an asset, pruning may have value. Under conditions where late-season yields are of little value and in which the plants are not extremely vigorous, the removal of the later cluster of blooms might be worth while and would be less laborious than pruning.

Tomato fertilizer experiments on Long Island, J. D. HARTMAN, P. WORK, and P. H. WESSELS (*[New York] Cornell Sta. Bul. 676 (1937), pp. 12, figs. 4*).—A series of fertilizer experiments repeated for 5 yr. showed that under the prevailing soil conditions, viz, a Sassafras silt loam located near Riverhead, L. I., tomatoes need all three of the principal elements—nitrogen, phosphorus, and potash. The value of stable manure was also indicated in that 10 tons of manure plus 720 lb. of superphosphate per acre gave slightly higher yields than were secured on the check plats, which received a basic treatment of 49.4 lb. of N, 115.2 lb. of phosphoric acid, and 60 lb. of potash per acre. Twenty tons of manure per acre, used alone, also gave yields significantly higher than the controls. Tomato yields were reduced more by the complete omission of phosphoric acid than by the omission of N, and in turn more by the omission of N than by the omission of potash. Where manure is economically available, an application of 10 tons of manure plus 1,200 lb. of a 4–10–5 fertilizer per acre is considered very satisfactory. In conformity with results obtained elsewhere, early yields were low when no phosphorus was used. All fertilizers were broadcast on the plats before planting and disked into the soil. Manure was applied in the early spring and plowed under.

A comparison of manure and peat for greenhouse tomato culture, J. R. HEPLER (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 537, 538; also New Hampshire

Sta. Sci. Contrib. 56 [1937], pp. 537, 538).—Comparisons at the University of New Hampshire of German peat with manure for spring crops of greenhouse tomatoes grown in ground beds the top soil of which was a compost of equal parts of heavy sod and cow manure indicated that peat may be substituted for cow manure at least every other year. Averaged over the 5 yr., 1932–36, the peat plats yielded 95 percent of those with manure.

The temperature of grafts as influenced by the type of wax and shading, O. F. Curtis and J. H. Blake (*North. Nut Growers Assoc. Proc., 27 (1936), pp. 41–44*).—With the use of thermocouples it was established in these studies at Cornell University that there is serious danger that grafts may become overheated in direct sunlight, especially if a dark-colored wax is used. Various methods of reducing the hazard, such as shading the graft and mixing aluminum powder and possibly chalk with the grafting medium, are discussed.

Chilling requirements for opening of buds on deciduous orchard trees and some other plants in California, W. H. Chandler, M. H. Kimball, G. L. Philp, W. P. Tufts, and G. P. Weldon (*California Sta. Bul. 611 (1937), pp. 63, figs. 27*).—Discussing briefly the need of most Temperate Zone plants for an exposure to a period of low temperature during the nonleaf period, the authors present the results of studies extending over the period 1924–37 of the situation in California. In nearly all sections where fruit was grown extensively, the amount of winter chilling was too small for buds to open as evenly and rapidly as they do in colder regions. Usually such delay was not serious in the areas north of the Tehachapi Mountains and, in fact, was even helpful by delaying bud opening until after the spring frost. South of Tehachapi, unusually mild winters caused much damage. Buds that should open in March may not open until May or June and then only a small percentage. Most of the blooms may fail to develop, and foliar development may be so sparse as to result in summer injury from sunscald and borers.

With apricots and some varieties of plums and peaches, there may occur considerable shedding of unswollen flower buds in late winter and early summer. With species that have compound flowers and leaf buds, some of the flowers may die, leaving the buds without flowers or with only two or three blooms. Fogs are important in relation to winter chilling, the trees so exposed being less apt to shed buds or to delay their opening unduly. Winter shade, such as given by a eucalyptus windbreak, may also be helpful.

Pointing out the marked differences between deciduous fruits as to the amount of chilling required, the authors discuss the characteristic responses to short winters of various fruits and ornamentals.

Fertilizing deciduous fruit trees in California, E. L. Proebsting (*California Sta. Bul. 610 (1937), pp. 29, fig. 1*).—Summarizing the results of tests carried on over a 10-yr. period with peaches, prunes, pears, apricots, and almonds, the author reports that none of the species gave profitable responses to potassium or phosphate. There was observed a general but not a universal response to nitrogen. Except for cyanamide, which may injure trees when used in large quantities or on alkaline soils, there appeared little choice between various sources of nitrogen, the selection depending primarily on profitable usage. Unless the soil was dangerously acid or alkaline, there was little hazard from the use of acid- or alkaline-promoting materials. Cyanamide injury was sometimes confined to tipburn, sometimes to heavy defoliation, and in certain cases resulted in the death of trees when excessively large applications were used.

The behavior of annual crops in the orchard is not considered a reliable guide to fertilizer treatment of the trees, since frequently trees make good

growth on soils so deficient in phosphate as not to be capable of producing good crops of corn. The only practical means of determining their nutrient needs is to note the response of the trees themselves. Lack of nitrogen is indicated in short growth of shoots, small yellowish leaves falling early, heavy fruit drops, and a failure of the fruit to size even when the crop is light and when proper pruning and irrigation practices have been followed. The interdependence of fertilization, pruning, and general soil management is emphasized.

Field studies of apple tree growth and fruiting, I-III, J. C. Wilcox (*Sci. Agr., 17 (1937), No. 9, pp. 563–572, fig. 1, Fr. abs. p. 572; pp. 573–586, fig. 1, Fr. abs. p. 586; No. 11, pp. 657–669, fig. 1, Fr. abs. p. 669*).—Three papers are presented.

I. *Sampling and measuring terminal shoots.*—Utilizing a large collection of records taken in a series of tree plats laid out in a mixed variety orchard at Kelowna, B. C., the author reports that the more upright the direction of terminal shoots the greater their length. Terminals growing at any one angle with the horizontal averaged a little longer at the top than at the bottom of the tree. The correlation between terminal growth and terminal diameter decreased as the position of recording the diameter varied from the base to the tip. Correlations between increases in trunk circumference and terminal diameter decreased in the same order, though the rate of decrease was much less.

II. *Correlations between growth and fruiting.*—The author shows from statistical analysis that as the size of the tree increased the rate of increase in trunk girth and terminal length tended to decrease. Vigorous trees grew more strongly in all respects than did weak trees. Positive correlations were observed between terminal length and increase in trunk circumference, both in the same year and in alternate years; also between each of these in any one year and the same in alternate years. Terminal diameter was correlated directly with both the terminal length and increase in trunk circumference. Negative correlations were found between the percentage bloom or set one year and the same the following year, and also between the percentage bloom or set and the increase in trunk circumference. Between percentage bloom or set and terminal length, the correlations were positive.

III. *Some observations on the measurement of tree vigour.*—No one measurement of tree vigor appeared to be infallible, leading to the suggestion that in field plat work at least the trunk circumference and terminal length should be recorded annually, although for general trends over a period of years increase in trunk circumference alone may be sufficient. In addition, records of leaf area are deemed valuable. The "growth index," the product of the annual increment in trunk circumference by the average terminal length, was a satisfactory measure of vigor.

The Northern Spy as a rootstock when compared with other standardized European rootstocks, J. Hearman (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 3, pp. 246–275, pls. 8, figs. 8*).—Among interesting observations in this study, in which 47 trees of different ages were excavated, was the low power of recovery of Northern Spy rootstocks after transplanting. The root systems of Northern Spy were weak, sparse, and poorly developed, with little fiber. The main scaffold roots appeared to be shallow, with the deeper penetrating ones near the extremities. In general, it appeared that Northern Spy has a very distinctive natural root habit and is not able to adapt itself to uncongenial surroundings.

Stock and scion relationships in some four-year-old apple trees, R. C. Palmer and F. N. Hewetson (*Sci. Agr., 17 (1937), No. 9, pp. 551–562, figs. 4; Fr. abs. p. 562*).—A total of 172 4-year-old trees representing 14 varieties worked

on piece roots of Canada Baldwin seedlings were excavated in November 1933 by the Dominion Experimental Station at Summerland, B. C. Among important observations were that there were significant differences in the average weights of the root systems under the several varieties. Hyslop and U. S. D. A. No. 227 varieties which developed large tops and a comparatively large quantity of scion roots, induced exceptionally vigorous growth in the seedling root system. Scion varieties differed in their capacity to overcome variation in the seedling roots, with indications that the more vigorous the scion the more uniform the trees. The scion variety exerted a significant influence on the spread and depth of root development made by the seedling understock.

Location of the line of union in a cleft graft, F. C. Bradford (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 295, fig. 1; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, p. 48*).—In a cleftgraft union of two Woodmansee apple scions on Longfield stock, the callus tissue of the stock overgrew to 2 in. above the point where the stock was originally cut off, and gave rise to a small branch bearing Longfield apples. The author suggests that this phenomenon may have led occasionally in the past to the erroneous thought that the stock had influenced the character of the scion.

Double growth rings in Red Astrachan, M. A. Tingley (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 61, fig. 1; also New Hampshire Sta. Sci. Contrib. 53 [1937], p. 61, fig. 1*).—Stating that the term "annual ring" is not fully accurate since rings may be omitted certain years and more than one formed other years, the author describes a condition found in cross-sections of the trunks of Red Astrachan trees. There was observed a pattern of three rings, one moderate in width, one very narrow, and one wide. Apparently, one ring was formed in the off-year and two in the bearing year. It is suggested that cambial growth may have been checked by the use of most of the photosynthate in maturing the fruit of the Red Astrachan. No such pattern was observed in McIntosh, Delicious, and Northern Spy varieties ripening their fruit in autumn.

Frost rings in hardy varieties of apple, M. A. Tingley (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 57–60, fig. 1; also New Hampshire Sta. Sci. Contrib. 52 [1937], pp. 57–60, fig. 1*).—Examinations of the wood obtained by means of a Swedish increment borer from the trunks of low-headed, mature trees of McIntosh, Red Astrachan, Delicious, and Northern Spy showed, in certain years, peculiar rings of parenchyma-like cells lying just outside the late-formed wood of the preceding year. These rings are believed to result not always from extremely low winter temperatures but from late autumn freezes occurring before the trees have attained their maximum degree of resistance. Heavy production may also be a factor in rendering trees susceptible to this injury. The occurrence of these rings was associated with the variety, McIntosh being susceptible and Red Astrachan only slightly so.

Observations on the effect of potash supply on the water relations of apple trees, L. G. G. Warne (*Jour. Pomol. and Hort Sci., 15 (1937), No. 1, pp. 49–65, fig. 1*).—Studies of the comparative conductivity of shoots, leaf area, and stomatal frequency of apple trees receiving abundant and deficient supplies of potash showed that insufficient potash results in a significant decrease in shoot length, number of leaves and leaf area per shoot, and conductivity of shoots, and an increase in stomatal frequency. Decreases noted in the ratio of conductivity to leaf area and conductivity to the number of stomata are offered as explanations for the extreme susceptibility of potash-deficient trees to drought.

Unfrozen water in apple shoots as related to their winter hardiness, A. L. Stark (*Plant Physiol., 11 (1936), No. 4, pp. 689–711, figs. 9*).—Using shoots of 15 apple varieties representing a range in hardiness from very tender to

extremely hard, the Iowa Experiment Station found by the heat-of-fusion method that, in general, the capacity to retain water against freezing is associated with known winter hardiness. From summer to winter there was a marked decrease in the moisture content of the shoots in all varieties. During winter the percentage of water reached a low level that remained rather constant until spring, when it rose abruptly. Some evidence was obtained that the freezing process in apple shoots is partially reversible, resembling the behavior of an inelastic gel. Although the varieties differed in their capacity to retain water against a temperature of −20° C., it was impossible on this basis to separate the varieties into definite hardy and tender classes.

Unusual and severe winter injury to the trunks of McIntosh apple trees in New Hampshire, C. O. Rawlings and G. F. Potter (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 44–48, fig. 1; also New Hampshire Sta. Sci. Contrib. 5 [1937], pp. 44–48, fig. 1*).—Observations in the summer of 1936 by the New Hampshire Experiment Station in a McIntosh orchard located on a comparatively poor soil near Wolfeboro showed serious trunk injury despite the fact that the spurs were so completely unharmed as to permit a full crop of fruit to set and mature. Of approximately 400 trees, about 75 were completely girdled and another 60 had dead areas extending one-third to three-fourths of the distance around the trunk. The possible association of the trunk injury with fall applications of available nitrogen and with mild temperatures in November are discussed.

Can bees retain pollen of early apple varieties for effective pollination of later blooming sorts, L. P. Latimer (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 16–18; also New Hampshire Sta. Sci. Contrib. 57 [1937], pp. 16–18*).—Employing McIntosh trees enclosed in cheesecloth cages and bees which had not been permitted to visit apple blossoms for various specified periods, the author found that even such a brief interim as two days was sufficient to interfere with successful pollination. Although the unnatural conditions in the cages may have interfered with pollination activity of the bees, it was observed that where Northern Spy blossoms were placed in the cage the set was increased five times and the number of seeds in the fruit was doubled. The large percentage of lopsided fruits and of empty cavities indicated, however, that conditions within the cage were not optimum for effective cross-pollination.

Self- and cross-pollination in the McIntosh apple and some of its hybrids, L. P. Latimer (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 19–21, fig. 1; also New Hampshire Sta. Sci. Contrib. 58 [1937], pp. 19–21, fig. 1*).—Various relatives of McIntosh, such as Cortland, Melba, Early McIntosh, Milton, and Macoun were tested as to compatibility with McIntosh. In addition, self-pollination tests were made, showing a high degree of self-unfruitfulness except in Melba. However, the selfed Melba fruits contained few seeds, often none, but were normal in shape although the seedless apples were about 20 percent smaller than those with seeds. Cortland crossed to Early McIntosh gave poor sets and a high percentage of lopsidedness, indicating cross incompatability. No significant differences in weight were found between self- and cross-pollinated fruits of McIntosh, Cortland, Milton, and Macoun except when the crop was heavy. Melba and Macoun set a considerably larger percentage of fruit than did McIntosh, Cortland, or Milton, regardless of the pollen variety. On the whole the various McIntosh types proved satisfactory pollinizers except in the aforementioned case of Cortland crossed with Early McIntosh.

The effect of reducing the number of functioning stigmas on fruit-setting and characteristics of the McIntosh apple, L. P. Latimer (*Amer. Soc. Hort.*

Sci. Proc., 33 (1936), pp. 22–25, fig. 1; also New Hampshire Sta. Sci. Contrib. 59 [1937], pp. 22–25, fig. 1).—In 1929 just as the petals were unfolding, some of the stigmas were removed from the flowers of a moderately vigorous McIntosh tree and the pollen of a Red Astrachan tree applied to those remaining. The average number of seeds per fruit for apples with 1, 2, 3, 4, and 5 stigmas was 2.3, 5.8, 5.1, 4.8, and 8.4, respectively. No fruit set where all the stigmas were removed. Subsequent studies of McIntosh pollinated with Delicious showed less difference in the number of seeds resulting from the number of stigma removals. The results obtained from 2, 3, and 4 stigmas were much alike and intermediate between the 1- and 5-stigma classes. A high correlation of +0.942 was observed between the number of empty locules and the percentage of lopsided fruits and a high negative correlation of −0.878 between seed content and percentage of misshapen fruits. On the whole, the study showed that it was possible to secure a normal set of McIntosh with less than 5 functioning styles and explained results often observed in the orchard following spring freezes.

Biennial bearing of McIntosh, G. F. Potter *(Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 139–141; also New Hampshire Sta. Sci. Contrib. 56 [1937], pp. 139–141).*—Following a severe frost in the spring of 1932 which practically destroyed the entire crop, McIntosh trees growing in the orchard of the University of New Hampshire took on a pronounced biennial bearing tendency, as indicated in average yields of 0.8, 14.4, 2.0, 13.0, and 3.6 bu. in the years 1932–36, respectively. Attempts in the spring of 1935 to restore the annual habit to comparable McIntosh trees by fruit thinning at different times gave promising results. In the case of trees thinned within three weeks of the blooming period, an average of 25 percent of the spurs produced blossoms in 1936, as compared with 5.7 percent for the control trees. Thinning nine weeks after blossoming was not effective at all. The immediate effect of thinning was to reduce the yield but it increased the size, color, and probably the market value of the fruits.

A study of the extent to which apple orchard cultivation may be reduced, G. H. Dickson *(Sci. Agr., 17 (1937), No. 11, pp. 670–677, figs. 2; Fr. abs. p. 677).*—Using a 6-acre block of apple trees planted at the Ontario Horticultural Experiment Station in 1920 and handled until 1928 under uniform soil management, only slight differences were obtained between different cultural treatments. Duchess, Northern Spy, and Wealthy produced more fruit under minimum cultivation, while Baldwin and McIntosh fruited more abundantly under the usual orchard care. On the other hand, McIntosh trees were larger under minimum cultivation, while Baldwin, Duchess, Northern Spy, and Wealthy trees made greater trunk development under longer cultivation. There was some indication that early-sown green manure crops may reduce the available nitrates to a harmful degree.

Removal of spray residue from apples, C. W. Ellenwood, V. H. Morris, and E. A. Silver *(Ohio Sta. Bul. 584 (1937), pp. 40, figs. 5).*—Summarizing the results of 2 years' spray residue experiments, the authors present information regarding spray programs and washing technic that makes possible the successful cleansing of apples. When the use of lead arsenate was confined to the petal fall spray, followed by one cover spray the first week in June, the lead residue was well within the tolerance. Lead residue increased in proportion to the number of cover sprays containing lead arsenate applied after July 1. The substitution of calcium arsenate for lead arsenate in the late summer spray reduced the lead without a significant reduction in arsenic. Heavy rainfall in the late summer and early autumn of 1935 was not particularly helpful in meeting tolerances.

Washing fruit once in the under brush flood type washer, using either 1 or 1.5 percent acid solution, almost invariably reduced lead residue well below the tolerance even when the apples had received seven cover sprays. Heating the washing solution increased its effectiveness. The flotation washer was not as effective as the under brush flood type. Russeting of apples resulted in a heavier deposit of residue and greater difficulty in washing. The mechanical brush did not prove satisfactory for removing spray residue, and tandem washing was not found necessary under Ohio conditions. There was no indication that washing lessened the keeping quality of fruit.

The use of oil as a supplement to lead arsenate in the first or in the first and second cover sprays caused no appreciable increase in lead residue at harvest time. Sodium silicate used in connection with the regular lead arsenate midsummer spray resulted in serious injury to Baldwin foliage. Applied a week before harvest, sodium silicate reduced the residue, but not sufficiently to avoid the need of washing apples which had received a late July application of lead arsenate.

The relation of washing operations to bruising and keeping quality of McIntosh and Northern Spy apples, R. E. Marshall (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 34–42, fig. 1*).—Sample lots of McIntosh and Northern Spy apples obtained from growers and packing houses at three stages, (1) upon delivery to the packing house, (2) after washing, and (3) after washing, grading, sizing, and packing, were brought to East Lansing and placed in cold storage. Observations at the time of collection indicated that the personal factor in handling fruit is of great importance in respect to the amount of bruising during the washing process. Padding of the wood in the washers with sponge rubber at points where apples drop or roll is advised. In general, both prewashing and postwashing operations caused more bruising on both varieties than did the actual washing process. Washing practices did not affect the rate of softening, rate of decay, or rate of moisture loss in storage, nor did they affect the rate of moisture loss in apples subsequent to their removal from storage. Large Northern Spy apples (3.5 in. in diameter) in the 1936 crop were more susceptible to physiological break-down or decay than were the smaller apples.

Effect of delay in storage and storage temperature on the keeping qualities of apples, E. J. Rasmussen (*New Hampshire Sta. Tech. Bul. 67 (1937), pp. 55, figs. 11*).—With the aid of automatically controlled storage equipment which enabled the maintenance of temperature at desired points, the author established certain facts as to the keeping of Baldwin, McIntosh, and Cortland apples. Firmness of flesh, the skin removed, was found the most effective measure of changes during ripening in storage. Temperature was one of the important factors influencing keeping quality, but temperatures that maintained firmness were not necessarily most desirable from the standpoint of flavor and color development. For example, McIntosh at 30° F. remained firmest but never developed the characteristic flavor and aroma. Baldwin developed a more characteristic flavor at low temperatures than did McIntosh and retained its marketable qualities longer. The rate at which ripening progressed following removal from cold storage also differed with varieties. McIntosh developed its highest flavor in common storage but became soft-ripe in 2 mo.

The treatment of fruit immediately following picking had a potent influence on storage behavior, e. g., McIntosh delayed 5 days before storing showed twice as much decrease in firmness 1 mo. after harvest as did fruit stored immediately. As to effect of differential cultural and fertilizer treatments on keeping quality, Baldwin apples showed no significant response. Orchard site

or type of soil appeared to have more effect on quality of Baldwins than did fertilizer treatments in the same orchard. Baldwins grown in a well-drained loam on a ridge were superior in flavor and appearance to those produced on bottom land. Drought injury to McIntosh did not increase in storage. Apple fruitfly or railroadworm became inactive in apples stored at from 30° to 32° and was killed 1 mo. after storage, while in common storage the insect continued its normal development. Apple scab increased in size in storage but less rapidly at low temperatures. Cortland apples harvested with a tinge of yellow in the ground color showed very little scald in storage and kept more satisfactorily than fruit of earlier or later harvests.

Relative efficiency of spur and shoot leaves for fruit growth of pears, W. W. ALDRICH (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 227–232, fig. 1*).—Studies conducted by the U. S. Department of Agriculture near Medford, Oreg., with ringed limbs of Anjou, Bosc, and Bartlett pears showed in 8 of 10 experiments that a unit area of shoot leaves induced greater fruit enlargement than did an equal area of spur leaves. In the two exceptions the differences were not significant. An area of 400 cm² of Anjou shoot leaves produced 24–49 percent more fruit dry matter than did an equal area of fruit spur leaves. Reduced to a weight basis, 1 g of Anjou shoot leaves produced 12–29 percent more fruit dry matter than did 1 g of spur leaves. Based on dry weight determinations on leaf disks of known area, the shoot leaves had a greater weight of dry matter per unit area than did the spur leaves. No adequate explanation was found for the differential activity.

Effect of ethylene and certain metabolic gases upon respiration and ripening of pears before and after cold storage, E. HANSEN and H. HARTMAN (*Plant Physiol., 12 (1937), No. 2, pp. 441–454, figs. 5*).—Working with Bartlett, Beurre Bosc, Comice, and Anjou pears gathered at approximately 10-day intervals beginning a month or so prior to and extending beyond the usual harvest season, the Oregon Experiment Station found that the effects of ethylene are confined definitely to the period preceding the stage in the life of the fruit when the maximum level in respiration has been reached. Results with fruits treated after delayed periods of storage showed clearly that ethylene treatment is effective only during the period of ascending respiratory activity. No increase in respiration or ripening was obtained with ethylene in the case of pears which had been held in cold storage for some time. The emanations from ripe pears were found to increase the rate of respiration and ripening in freshly gathered Bartlett, Comice, and Anjou pears.

Testing of new varieties of peaches, B. D. DRAIN (*Tenn. State Hort. Soc. Proc., 32 (1937), pp. 64–66, fig. 1*).—In commenting on the characteristics of several of the newer varieties of peaches, the author presents a chart showing graphically their comparative harvesting dates.

A progress report on comparisons of high-calcium and high-magnesium limes in bordeaux on sour cherry, and in zinc-lime and iron-lime mixtures on peach, E. J. RASMUSSEN (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 279–284, fig. 1; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 49, 50*).—In 1936, a year characterized by high temperature, low rainfall, and low relative humidity to the middle of August, high-magnesium lime bordeaux caused less defoliation and had less dwarfing effect on Montmorency cherries than did high-calcium lime bordeaux. The copper in the high-magnesium lime bordeaux is apparently held in a less soluble form which is less toxic to the foliage and not so readily washed off or absorbed. The concentration of both high-magnesium and high-calcium lime bordeaux was found to influence growth of shoots and trunks, size of fruit, and the percentage of solids in the fruits.

All the zinc sulfate and iron sulfate lime mixtures tested gave satisfactory control of arsenical injury on the peach, but the high-calcium lime zinc sulfate mixture caused less defoliation than did the high-magnesium lime zinc sulfate mixture. Zinc oxide and manganese sulfate in combination with high-calcium lime were unsatisfactory. Zinc sulfate used without lime in combination with lead arsenate caused serious defoliation of the peach.

Cherry pollination and variety investigations in New South Wales, 1930–34, F. T. Bowman (*N. S. Wales Dept. Agr., Sci. Bul. 55 (1937), pp. 31, figs. 5*).—Studies of self- and cross-fruitfulness revealed two groups of intersterile varieties—(1) St. Margaret, Noble, Black Republican, and Black Bigarreau, and (2) Early Lyons, Mezel, and Twyford. In addition, Napoleon was found incompatible with Reverchon and Early Rivers with Bedford Prolific and Black Eagle. Among effective combinations indicated were Napoleon and Florence and Early Lyons and Early Rivers. Off-type strains of Early Lyons were found frequently and indicated the importance of careful bud selection.

Cracking of cherries, W. R. Foster (*Sci. Agr., 17 (1937), No. 9, p. 550*).—Evidence is presented to the effect that spraying Bing cherries with a 2-3-40 bordeaux mixture 5 or 6 weeks before picking apparently reduced greatly the amount of cracking at maturity. As a further check, certain limbs on Lambert trees were sprayed and the fruits immersed in water for certain lengths of time. Again the bordeaux-sprayed fruits showed considerably less cracking.

Further studies of transpiration rates of fruiting canes and current season shoots of the black raspberry, R. E. Marshall (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 389–394; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, p. 49*).—Differences in rates of water loss from the leaves of the Cumberland black raspberry fruiting canes and current season shoots were not found of sufficient magnitude to account for rather pronounced differences in physiological behavior, such as the yellowing of cane foliage, apparent loss of vigor of canes, and the failure to maintain the production of large, succulent berries as the season advanced. Very close relationships were observed between such factors as soil moisture, temperature, humidity, and sunshine and the response of the plants. A liberal and constant supply of soil moisture, accompanied by moderate air temperatures, relatively high humidities, and many hours of sunshine, resulted in the development of abundant and vigorous shoots. The predominance of these ecological factors is believed to determine the location of successful raspberry production.

Raspberry nutrition.—III, Are sulphates deficient in B. C. coastal soils? G. H. Harris (*Sci. Agr., 17 (1937), No. 11, pp. 707–712, fig. 1*).—In this third contribution (E. S. R., 77, p. 340), the author reports that raspberry plants growing in pots of sterilized soils made much better growth than comparable plants in unsterilized soil. Analyses of the soils showed that sterilization in each case increased the available minerals, and the results indicated that the change in sulfate content was highly significant because the increase was so large that there was a possibility of very beneficial secondary effects. The pH of the soil was not appreciably influenced by sterilization, nor did the content of phosphates show any consistent increase due to the treatment.

Gas content of cranberries and possible relationship of respiratory activity to keeping quality, W. B. Esselen, Jr., and C. R. Fellers (*Plant Physiol., 12 (1937), No. 2, pp. 527–536, fig. 1*).—At the Massachusetts Experiment Station it was observed that submergence causes an increased rate of respiration in cranberries and an increase in the carbon dioxide content of the internal atmosphere. Respiration increased when the fruits were left on the vines beyond the usual picking season. Frosting reduced the rate of respira-

tion. Apparently, cranberries contained a definite amount of respirable material which is used up more rapidly under high rates of respiration, thereby shortening the potential storage life. Nitrogen content of the internal atmosphere was relatively constant and approximated that of the air. Carbon dioxide and oxygen contents of the internal atmosphere varied with the rate of respiration. Determinations of the carbon dioxide-oxygen ratio permitted a fairly accurate forecast of keeping capacity. No significant correlation was observed between catalase activity and respiration activity in stored cranberries.

A preliminary survey of the citrus industry in New Zealand: The historical, cultural, and economic aspects, W. M. Hamilton (*New Zeal. Dept. Sci. and Indus. Res. Bul. 53 (1937), pp. 269, figs. 53*).—This report traces the history of citrus growing in New Zealand and outlines present methods of production and marketing as the background for constructive suggestions for its development.

The filbert breeding project at Geneva, G. L. Slate (*North. Nut Growers Assoc. Proc., 27 (1936), pp. 62, 63*).—The breeding work of the New York State Experiment Station is said to have yielded a total of 1,462 filbert seedlings, which makes a total of 1,997 growing on the station grounds. The parental combinations used in producing the various crosses are listed.

Trees, shrubs, and vines at the North Platte Experimental Substation, H. A. McComb (*Nebraska Sta. Bul. 310 (1937), pp. 38, figs. 17*).—Herewith are reported the results of trials of numerous trees and shrubs, with discussion as to their adaptation and limitations.

FORESTRY

Principles of forest-fire detection on the national forests of northern California, S. B. Show and E. I. Kotok (*U. S. Dept. Agr., Tech. Bul. 574 (1937), pp. 32, figs. 9*).—An extended analysis of the forest fire detection problem in the northern California pine region led the authors to suggest that for forest types having rapid spread of fire and requiring ¼-hr. attack, not over 15 min. can be allowed for the discovery of the fires. This requires direct visibility and the continuous service of a primary lookout system. Other detection facilities, such as patrols, cooperative observers, lookout firemen, and travelers, are deemed desirable and necessary as supplementary services. For forest types with slower spread of fire and requiring 2- or 4-hr. attack, primary lookout service should still be on a direct-visibility basis, but supplementary detection methods, particularly lookout firemen, may be used with acceptable results.

Up to an average working distance of 15 miles from the lookout, except under conditions of abnormally poor visibility, most fires in the rapid-spread forest types can be readily detected within 15 min. after start on directly visible areas. In planning a detection system, direct visibility should be concentrated on known risk areas up to a 70–75 percent coverage of all high-risk zones. Direct visibility over the entire area is needed usually only when the risk is widely diffused or the risk areas cannot be clearly defined. Most economical and effective coverage may be obtained only through planning the detection system as a whole for major protected units. Piecemeal selection of points cannot give satisfactory service at a minimum cost.

Water utilization by trees, with special reference to the economic forest species of the North Temperate Zone, O. Raber (*U. S. Dept. Agr., Misc. Pub. 257 (1937), pp. 97*).—In presenting a review of some of the problems involved in the study of water relations of plants and of various contributions to the subject, with 249 citations to the literature, the author expresses the hope that the

material will be helpful to students and workers in enabling them to obtain a general perspective of the field, the present state of progress, and problems awaiting solution. The subject matter covered includes (1) water absorption, (2) storage, and (3) losses, (4) adaptation of trees to dry conditions, and (5) water consumption by trees. In general conclusion, he points out that the fundamental silvicultural problem, the minimum amount of water necessary to produce a crop of tress, is still unsolved and that more comprehensive studies with large trees are needed. Information is required on forest trees and stands under natural conditions, supplemented by laboratory investigations on a scale commensurate with the size of the problem.

Dormancy and germination of Fraxinus seeds, G. P. Steinbauer (*Plant Physiol., 12 (1937), No. 3, pp. 813–824, figs. 6*).—Studies at the University of Maine of conditions favorable to the germination of the seeds of red, green, white, and black ash showed that the black ash has different temperature requirements from the other three. This variation apparently depended on the developmental status of the embryos, that of the black ash being incompletely developed at the time of harvest. A period of two or more months at 20° C. was necessary to permit the embryo to become fully enlarged, following which black ash seeds responded to the conditions favorable for the other three species, stratification for 2 or 3 mo. at a temperature of from 5° to 10° in a moist place. Vitality was maintained in stored seed to the best degree when the moisture was kept at a point less than 7.5 percent of the dry weight. Dwarf seedlings were obtained from embryos excised from freshly harvested seeds of all four species.

Fertilization and proembryo formation in Sequoia, W. J. Looby and J. Doyle (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1937), No. 44, pp. 457–476, pls. 2, figs. 5*).—The two species *S. gigantea* and *S. sempervirens* were found to resemble each other closely in the structure of the mature gametophytes, male and female, as well as in the mechanism of fertilization. However, *S. sempervirens* completed its development in 1 yr., as compared with 2 yr. for *S. gigantea*. Notable differences were found in proembryo formation.

The history of shipmast locust, S. B. Detwiler (*Jour. Forestry, 35 (1937), No. 8, pp. 709–712, figs. 2*).—A brief account is given of the history of a variety of locust distinguished from the ordinary locust by more erect habit of growth, greater durability of the wood in the soil, and general absence of seed production. The place of origin is not known, but records indicate that the tree was brought to Long Island from Virginia or some point south.

Experiments in propagating shipmast locust, C. F. Swingle (*Jour. Forestry, 35 (1937), No. 8, pp. 713–720, figs. 4*).—Since the shipmast strain of locust produces very few or no seeds, vegetative propagation is the only means of increase. Roots gathered on Long Island were shipped to Arlington (Va.) Experiment Farm, made into cuttings, and planted under several soil conditions. Roots less than 0.25 in. in diameter gave uniformly poor results, and, on the whole, roots from 0.25 to 1 in. appeared most practical. Roots dug in June and July after top growth had started were decidedly inferior for propagation. Upright planting gave better plants than did a horizontal position. Light sandy soil proved much better as a rooting medium than heavy soil. Tests with softwood cuttings were not successful. Summing up, the author states that root cuttings offer the only present known practical means of large-scale production of the shipmast locust. For small plantings natural root sprouts are a good source of stock.

Growth and yield in shipmast locust on Long Island and its relative resistance to locust borer injury, R. C. Hall (*Jour. Forestry, 35 (1937), No. 8, pp. 721–727, figs. 4*).—A comparative study of the shipmast and the common locust showed the former to be more resistant to the locust borer and longer-

lived. On the whole, locust borer damage was in inverse proportion to the vigor of the tree. Records on the survival of ordinary seedling locust and of vegetatively propagated shipmast locust showed no significant differences, but the shipmast trees made notably greater height growth in the first year.

Carbohydrate changes within the needles of Pinus ponderosa and Pseudotsuga taxifolia, C. L. WORLEY (*Plant Physiol., 12 (1937), No. 3, pp. 755–770, figs. 5*).—Samples of needles collected at 15-day intervals throughout the period September 1935–May 1936 were analyzed at the University of Idaho for carbohydrate changes. The alcohol-soluble free reducing substances maintained low percentages and limited variations during the colder weather. The distinct gain in alcohol-soluble acid-hydrolyzable reducing substances in the autumn months, with its maintenance throughout the winter, suggests a definite inverse relationship of this fraction with prevailing temperatures. Alcohol-insoluble acid-hydrolyzable reducing substances, which contain starch, other dextrosans, and reserve hemicelluloses, increased rapidly immediately following a sudden drop in temperature; during gradual temperature changes a positive relationship existed.

Growth of second-growth pine on the coastal plain soils of Arkansas, L. M. TURNER (*Arkansas Sta. Bul. 342 (1937), pp. 52*).—Based on studies in four counties, Ashley, Bradley, Columbia, and Howard, and involving 222 plats with measurements of 8,834 trees located on phases of 22 soil series types, the author concludes that certain soil types or phases thereof of the coastal plain region of Arkansas are adapted to the requirements of loblolly pine only, others to both loblolly and shortleaf pine, and still others to shortleaf only. Considerable range was observed in height growth rate, diameter-volume growth, and ultimate timber yield on the various soil complexes. It was not possible to correlate the occurrence of the pine species nor the rate of growth with quantitative differences in any single site factor, such as slope, exposure, pH reaction, or depth or physical condition of a single soil horizon. It was possible to relate the occurrence of the two species and their rates of growth to certain measurable site-soil complexes, such as are expressed in phases of specific soil series types or in certain soil profile patterns. Site classes for loblolly pine—110, 100, 90, 80, 70, and 60 ft.—and for shortleaf pine—90, 80, 70, and 60 ft.—are discussed, and yield tables applicable to each species for each site class are provided.

A simplified method of constructing merchantable board-foot volume tables, R. H. BLYTHE, JR. (*Jour. Agr. Res. [U. S.], 55 (1937), No. 3, pp. 159–173, figs. 7*).—A simple method of constructing volume tables showing the merchantable volume of trees in board feet is presented, which gives a better estimate of the truly merchantable contents than former tables because it takes into account the fact that the upper limit of merchantability is usually fixed by the presence of large limbs or deformities of the bole rather than by minimum diameter. Only four measurements on each sample tree are needed, and 100 trees or less are usually sufficient. The method consists of a basic set of curves of volume over diameter breast high (inside bark) which are modified by two factors, a measure of butt swell and a measure of form or taper. One variation of the method eliminates all need for curve fitting, either mathematical or freehand; thus from one set of data all workers would produce identical tables.

DISEASES OF PLANTS

The Plant Disease Reporter, September 1 and 15, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 16, pp. 295–313; 17, pp. 316–324, pl. 1, figs. 3*).—The following reports are included:

No. 16.—Ruffle-leaf—a new disease of tobacco in North Carolina, resembling the South African "kroepoek" disease, by S. G. Lehman; tobacco diseases (brown root rot, streak, and mosaic) in Kentucky, by W. D. Valleau; correlation between winter temperatures and incidence of sweet corn wilt in New Jersey, by C. M. Haenseler; bacterial wilt of corn in 1937—reports from Massachusetts, Connecticut, New York, New Jersey, Maryland, Ohio, and Indiana, by J. I. Wood; notes on incidence of cereal rusts, crop season of 1937, by H. B. Humphrey; onion mildew (*Peronospora destructor*) in Oregon and the advisability of testing malachite green as a control agent for downy mildews, by F. P. McWhorter and J. Pryor; notes on vegetable and fruit diseases in Connecticut, by A. A. Dunlap; tomato diseases in Chautauqua County, New York, by C. K. Bullock; *Ascochyta sorghina* Sacc. on sorghum in Alabama, by W. W. Diehl; notes on Dutch elm disease confirmations; and winter injury to ornamental woody plants in Maine, including data on 29 conifers and 78 nonconiferous shrubs and trees, by M. T. Hillborn.

No. 17.—Distribution of rose anthracnose (*Sphaceloma rosarum*) in California, by A. E. Jenkins; diseases of Green Refugee beans in New York in 1937, by J. G. Horsfall, W. H. Burkholder, and O. A. Reinking; the effect of temperature and moisture on vegetable diseases in New York State in 1937, by C. Chupp; plant diseases reported in Maryland, by R. A. Jehle and E. A. Walker; and additional reports on bacterial wilt of sweet corn for northern New England and West Virginia.

[Plant disease work by the Arizona Station] (*Arizona Sta. Rpt. 1936, pp. 71–78, figs. 2*).—Progress reports are included on rots of date fruit; angular leaf spot of cotton; Texas root rot of cotton (including chemical treatment, studies of the sclerotia, root rot in pecan orchards, root rot surveys, and new hosts); and miscellaneous studies, including crown gall, gummosis of *Elaeagnus angustifolia*, *Fusarium oxysporum* wilt of stock, and *Fusarium* root rot of rose.

[Plant disease work by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 90–94, 127*).—Results are given relative to sorghum diseases, wheat take-all, dry-land foot rot of wheat, oat smut, wheat bunt and flag smut, and alfalfa diseases, by L. E. Melchers and C. L. Lefebvre; potato diseases (*Rhizoctonia* and seed piece decay), sweetpotato diseases, and breeding of mosaic-resistant cucumbers, all by O. H. Elmer; resistance of winter wheat to leaf rust (*Puccinia triticina*), by C. O. Johnston; and shoot, crown, and root-rot disease of milo, by F. A. Wagner.

[Plant disease work by the New Hampshire Station] (*New Hampshire Sta. Bul. 296 (1937), pp. 7, 8, 9, 10, 12*).—Progress reports are given of studies by O. Butler on potato mosaic and leaf roll masking under favorable conditions, on injury from lime-sulfur sprays, and on test sprays for apple scab, and on potato scab control.

Preparation and properties of bordeaux mixture, F. J. Schneiderhan (*West Virginia Sta. Bul. 283 (1937), pp. 30, figs. 11*).—The history of bordeaux mixture is first reviewed (with 28 references), and the scope of the present study outlined.

The data from tests of bordeaux mixtures of 49 formulas indicate that instant bordeaux prepared from pulverized $CuSO_4$ and high calcic hydrate gives higher average suspensions than mixtures prepared from stock solutions of $CuSO_4$ and quicklime or from low calcic hydrate. With both limes from the same limestone, the chemical hydrated form proved comparable in activity to quicklime as judged by its dispersion. Freshly prepared milk-of-lime gave slightly higher suspension in 4-4-50 mixture than 15-day-old milk-of-lime. Spherulites, formed during decomposition of the mixture, appeared first with the 4-4-50 formula after

7.5 hr. at 23°–25° C. Addition of 1.5 percent of bentonite delayed their formation 28.5 hr., and they did not form in 15 days when 0.5 percent of sugar or 0.5 percent of tannic acid was added to this formula. Color-chart determinations of 23 formulas indicated that no two are identical in color. The highest suspension, as in the 3–1.5–50 formula, was correlated with the deepest shades of blue. Mixtures of low $CuSO_4$ concentration and high suspension, as in 1–1–50 and 2–1.5–50 formulas, had a lighter shade of blue than those of higher concentration and high suspension, as in 3–1.5–50 and 4–3–50 formulas. Addition of lead arsenate (3 lb. per 100 gal.), and of magnesium and calcium arsenate (2.5 lb. per 100 gal.) caused no significant change in the suspension of the 4–4–50 mixture. Addition of bentonite, tannic acid, or sugar aided the suspension of this mixture after 3 hr.

Tumor production by hormones from Phytomonas tumefaciens, G. K. K. LINK and H. W. WILCOX (*Science, 86 (1937), No. 2223, pp. 126, 127*).—In the experiments here briefly recorded, wound responses resembled those induced by extracts of *P. tumefaciens* [=*Bacterium tumefaciens*] and heteroauxin applications in intact hypocotyls of the red kidney bean (*Phaseolus vulgaris*), but were less intense and better integrated. From the results obtained, it is believed that disturbance of the usual auxone concentration of the affected tissues is one of the causes of the cell enlargement characterizing these effects. "This disturbance, possibly a hyperauxony, gives hypocotyledonary cells opportunities to realize potentialities of cell enlargement, division, and differentiation not stimulated to or inhibited from expression in the course of normal development. . . . Since heteroauxones produced by non-gall-forming organisms incite tumors in plants not parasitized by these organisms and since wounding alone leads to tumor production, it appears that gall production by a particular parasite in a particular host is initially conditioned by factors determining specificities of parasitism."

Rhynchosporium scald of barley, rye, and other grasses, R. M. CALDWELL (*Jour. Agr. Res.* [U. S.], *55* (*1937*), *No. 3, pp. 175–198, pls. 4, figs. 4*).—In this cooperative contribution by the U. S. D. A. Bureau of Plant Industry and the Wisconsin and Indiana Experiment Stations, following discussions of the history, distribution, hosts, economic importance, and symptoms of the disease, an emended description of the genus *Rhynchosporium* is presented which included a consideration of its characteristic fructifying structures. Scald of *Dactylis glomerata* was found to be caused by *R. orthosporum* n. sp., which differs in its cylindrical conidia from *R. secalis* on barley, rye, and a number of grasses. *R. alismatis* is excluded from the genus *Rhynchosporium*, as herein defined.

Six highly specialized physiologic races of *R. secalis* were found which can be distinguished by their capacity to parasitize the differential hosts, viz, *Secale cereale, Hordeum vulgare, H. jubatum, Agropyron repens, Bromus inermis*, and *Elymus canadensis*. The conidia of these six races from the hosts showed no important differences, but in culture some of the races were distinct in both colony type and conidium characters. Conidia of *R. secalis* germinated in distilled water at 4°–28° C., while the optimum for germ-tube elongation was 18°–21°. Fructification on the host in the greenhouse was inhibited at low relative humidities but occurred abundantly at 95 percent. Parasitism of the barley plant is initiated by penetration of the leaf cuticle, the fungus establishing itself and making its initial development in the subcuticular position. The epidermal cells collapse under the mycelium, this being followed by penetration of branches of the subcuticular mycelium, through the walls of the epidermis, into the mesophyll tissue. The subcuticular mycelium proliferates and enlarges to form a fertile stroma, from one to several cells in thickness, upon the epidermis. The cuticle

is dislodged before fructification. Conidia are formed directly on the cells of the stroma over the entire collapsed area of the lesion. The barley race was shown to overwinter in Wisconsin on dead tissues of plants infected during the previous season.

Longevity of Gibberella saubinetii and other fungi in barley kernels and its relation to the emetic effect, R. G. Shands (*Phytopathology, 27 (1937), No. 7, pp. 749–762, fig. 1*).—In this cooperative study between the University of Wisconsin and the U. S. D. A. Bureau of Plant Industry, laboratory platings were made of scabbed barley in which the disease was induced by inoculations with *G. saubinetii* during and after the flowering period. Relative to the decline in viability of the fungus in infected barley kernels, it was found that a rapid decline began at 9–10 mo. after harvest, and in one test the fungus was plated from 91 percent of the kernels at 8 mo. thereafter. Of the kernels plating the fungus at 8 mo., about 57 percent yielded it at 13 mo., 8 percent at 15 mo., and 0.54 percent at 27 mo. after harvest. The maximum longevity obtained was 27 mo. Fungi of several other genera (*Fusarium, Helminthosporium,* and *Alternaria*) remained viable in barley kernels much longer. The longevity of fungi (*Gibberella, Alternaria, Helminthosporium,* and *Penicillium*) in barley kernels was apparently affected to some extent by storage conditions.

Pigs were drenched with water extracts of scabbed barley at 56 mo. after harvest, and the emetic principle was found to be still active. At that time *G. saubinetii* had been nonviable for at least 26 mo.

A further note on the fungus causing a white foot rot of wheat and oats, R. Sprague (*Phytopathology, 27 (1937), No. 7, pp. 798–800*).—As determined through this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Oregon Experiment Station, the eyespot or elliptical type of lesion found at the bases of culms of wheat and oats in the coastal counties of Oregon is not caused by *Gibellina cerealis*, but by a nonsporulating fungus referable to *Rhizoctonia*. The original tentative diagnosis (E. S. R., 72, p. 491) was based on reputed cultures of *G. cerealis* sent from Italy, which was then the only source. Recent authentic cultures of *G. cerealis* from England show that neither the Italian nor the Oregon material is *Gibellina*.

False "black chaff" of wheat produced by inoculating with stem rust, E. S. McFadden (*Phytopathology, 27 (1937), No. 7, p. 801*).—False black chaff of Hope and H-44 wheats, heretofore confused with the lesions produced by various other pathogens, is demonstrated to be the result of a peculiar reaction to infection by *Puccinia graminis tritici*. The "black chaff" reaction appears to be confined entirely to wheats having a specific type of mature-plant resistance to rust.

Effect of the dwarf disease on the alfalfa plant, J. L. Weimer (*Jour. Agr. Res. [U. S.], 55 (1937), No. 2, pp. 87–104, figs. 10*).—This cooperative study by the U. S. D. A. Bureau of Plant Industry and the California Experiment Station, continuing earlier work (E. S. R., 76, p. 344), indicated that affected alfalfa roots have more or less yellow color in the wood, owing largely to gum in the vessels. In late stages a yellow stain, diffusing into surrounding tissues, also occurs. The gum, similar in character to wound gum, is limited almost entirely to vessels of the outer xylem. In early stages this gum is limited to a few vessels in one or more bundles of the upper part of the taproot or crown, but later the whole root system becomes involved. Gum occurs in the green stems, if at all, only in the basal 1–2 in. Some of the gum is evidently forced from adjacent cells into the ducts, where it appears as globules or thin sheets along the inner wall surfaces. Eventually many of the ducts become completely filled and are rendered functionless. Many bacteria-like

bodies occur in some of the vessels. Microchemically, they are very similar to the gum in which they are embedded and unlike bacteria in several other respects. In healthy plants the water content of the tops was slightly higher than that in diseased tops, while the reverse was true of the roots. Transpiration was about 1.6 times as fast in healthy as in diseased plants. Water could be pulled through segments of healthy roots about 1.6 times as fast as through comparable diseased roots, indicating a close correlation with the transpiration rate. Diseased tops had a slightly higher pH value and a higher titratable acidity than healthy tops. In the roots there was no difference in pH value, but diseased roots had a lower titratable acidity (one experiment excepted). It seems probable that the differences in acidity between healthy and diseased plants were due to growth variations. Affected roots and tops had a higher ash content than comparable healthy plants. Qualitative tests indicated that the starch in diseased roots gradually diminishes and that it disappears altogether just before the plant dies.

Development of powdery mildew resistant cantaloup No. 45, I. C. Jagger and G. W. Scott (*U. S. Dept. Agr. Circ. 441 (1937), pp. 6, figs. 4*).—This cooperative contribution by the U. S. D. A. Bureau of Plant Industry and the California Experiment Station gives details respecting the origin, pedigree, and characteristics of this cantaloup variety developed by backcrossing the hybrid Hale Best × a resistant variety from India, resistance having proved to be a simple Mendelian dominant factor. The new variety resembles Hale Best but is somewhat later in maturing. It is generally entirely free from mildew in the Imperial Valley, and the crop has not been appreciably injured even in the coastal districts where conditions are very favorable to infection. In 1936 nearly half the cantaloup acreage in the Imperial Valley was planted with this variety, with a considerably larger proportion in 1937.

Crown infection of corn by Diplodia zeae, G. L. McNew (*Iowa Sta. Res. Bul. 216 (1937), pp. 187–222, figs. 7*).—Crown infection occurred on 14–52 percent of the field corn grown in Iowa, 1930–33. The symptoms include brown discolorations, disintegration and shredding of the internal tissues of the crown, and brown decay of the mesocotyl resulting in loss of the primary root system. By early establishment of adventitious roots, infected seedlings may survive and remain parasitized. Practically every plant from infected seed may show crown infection at maturity. Soil infection occurs through wounds from emerging seminal roots in the mesocotyl or at the point of emergence of adventitious roots at the crown, but the crown is usually invaded from the decayed mesocotyl. Although the fungus spreads upward for several nodes, it does not become systemic, and in the field it is usually restricted to the first internode above the roots. It may live in a soil devoid of plant refuse, but its development is hampered in mixed culture. Its presence in ordinary cornfield soil has been demonstrated. Invasion of the crown from the soil is most severe at high soil moisture contents, but development of infected plants is greatly reduced at both high and low moisture contents. At optimum soil moisture for the plants the dry weight was not reduced by crown infection. When reduced, the dry weight of roots was affected more than that of the tops in plants grown in infested soil. Light infection at low soil moisture may be almost as injurious as severe infection at high moisture content. The transpiration ratio of infected plants was increased at soil moistures favorable to reduction in dry weight. Mercury dust treatments apparently inhibited the fungus without killing it in the seed. They may thus delay mesocotyl invasion from infested soil and thereby lessen crown infection. Late crown infection is a significant phase of the parasitism of *D. zeae*. The fungus may reduce

the dry weight of the corn plant to half the normal under certain soil-moisture conditions, and under the most favorable field conditions there is a reduction in yield.

Selfed lines of corn had differing reactions to crown infection in the field, and have furnished some remarkably resistant lines for genetical studies.

Methods used in the determination of relative amounts of ear rot in dent corn, P. E. Hoppe and J. R. Holbert (*Jour. Amer. Soc. Agron.*, 28 (1936), No. 10, pp. 810–819, figs. 5).—In this study by the U. S. D. A. Bureau of Plant Industry in cooperation with the Wisconsin and Illinois Experiment Stations and a commercial seed company, the percentage of ears rotted in field samples was determined by count in each of 37 hybrids and varieties from 50-hill populations (about 125 ears per entry). The percentage of rotted kernels in the shelled grain from the same samples was then determined, using 200–300-g samples. Comparisons indicated the ear separation method to have been very inaccurate, the coefficient of correlation between the two methods being only +0.40. A modification involving the determination of the percentage of rot by weight gave better results, the correlation coefficient here being +0.62. These tests illustrate the difficulty of accurately measuring the amount of ear rot on a basis other than by the kernel separation method. Harvestings in December not only ran considerably higher in ear rot than those in October, but the differentials between resistant and susceptible strains were widened in the later harvestings.

Statistical analyses of the variability found in sampling lots of shelled corn are reported, these studies having been made on lots containing 5, 10, 15, 20, 25, 30, and 35 percent of rotted kernels by weight. "The results showed a general tendency for the standard deviation to increase as the percentage of kernel rot in the samples increased. Averages of all determinations for each sample size showed the following percentages of the samples to fall within the limits of ± a significant difference (5-percent point) from the mean of the 400-g samples from the same disease level: 25 g, 44.9 percent; 50 g, 62 percent; 100 g, 79.4 percent; 200 g, 94.6 percent; and 400 g, 100 percent. Thus, according to this standard for comparison, the determinations on the 200-g samples were in 95 percent of the cases as accurate as the results obtained from 400-g samples."

Relation of soil acidity to cotton root rot, J. J. Taubenhaus and W. N. Ezekiel (*Texas Sta. Bul. 545* (1937), pp. 39, fig. 1).—Following inoculation of *Phymatotrichum omnivorum* into cotton plants in adjoining containers filled with soils varying spontaneously in pH, the original incidence of root rot, its rate of spread, and the overwintering of the disease were greater in the alkaline than in the acid soils. Many other tests under controlled conditions and with pH adjustments by various means indicated that, in general, only low percentages of infection or overwintering occurred in soils more acid than pH 5.0, while at pH 8.0–8.5 high degrees of infection were obtained and the disease killed large numbers of plants for years thereafter. Additions of manure, fertilizers, or trace elements failed to reduce the overwintering of root rot. Cotton plants proved more tolerant to artificial "alkali soil" produced by additions of sodium carbonate than did the root rot fungus. Sulfur applied in relatively large amounts to the less calcareous soils acidified the soils but also injured the roots. Smaller applications were without injury and in various tests proved temporarily beneficial, or until the soil shifted back toward neutrality.

In general, the results of this study indicate that soils originally acid or made acid by suitable chemical means are less favorable to infection by this

fungus or to its continued survival than soils originally alkaline or made so by chemical means. This unsuitability of acid soils to the fungus is not necessarily due directly to the pH values but is associated more closely with this factor than with original differences in soil types. Practical applications of the findings are still experimental. Highly calcareous soils are unpromising, and only further tests of sulfur on noncalcareous soils can determine the value of repeated surface application of small amounts.

The interrelation of the pathogenicity of a Phoma and a Fusarium on onions, G. N. Davis and W. J. Henderson (*Phytopathology, 27 (1937), No. 7, pp. 763–772, figs. 6*).—Through this study by the Iowa Experiment Station, *P. terrestris* and *F. zonatum* f. 1 were found to be the causal agents, respectively, of the pink root and bulb rot disease complex of onions in Iowa. Both fungi have the optimum temperatures of 25°–28° C. and grow readily at pH 3.8–7.6. Inoculation tests indicated that *P. terrestris* can attack onion roots from the seedling stage to maturity, while *F. zonatum* f. 1 functions as a wound parasite or secondary invader. *P. terrestris* was isolated from the roots only, while *F. zonatum* f. 1 was recovered from both root and bulb tissues. Both seed and soil treatments proved ineffective for control. Selection and inbreeding of Red and Yellow Globe onions resulted in five strains in which losses from bulb rot (field and storage) were less than 5 percent, but little progress has been made in developing strains resistant to pink root.

An undescribed potato disease in West Virginia, C. R. Orton and L. M. Hill (*Jour. Agr. Res. [U. S.], 55 (1937), No. 2, pp. 153–157, pls. 6*).—A potato disease of unknown origin and etiology has been under observation by the West Virginia Experiment Station since 1931. The disease in some areas has become a limiting factor in potato production.

The first external symptoms are a dwarfing, paling, and upward folding of the terminal leaflets. Within 7–10 days the vines wilt and die. The vascular region of the stems, tubers, stolons, roots, and numerous regions in the pith of the stem turn brown. A discontinuous, dendritic necrosis of the stem-end of the tuber is one of the principal characteristics. The anatomical features of the young, terminal leaflets consist in lateral crowding of the palisade and mesophyll cells, failure to reach normal size, and elimination of intercellular spaces. These changes are accompanied by depletion of the chloroplasts and loss of starch grains and vacuoles. Finally, the chloroplast membranes disintegrate and diffuse throughout the cell. The nuclei retain their normal shape but stain heavily with safranine. An extensive necrosis develops in the phloem and adjacent parenchyma and to a lesser extent in the xylem and fundamental tissues. A granular deposit occurs in these necrotic areas, which sometimes show lysigenous cavities. The vessels are sometimes filled with granular material differing in staining reactions from that in the phloem and parenchyma. Before necrosis takes place the starch grains migrate toward the nuclei, become spherical, and undergo gradual dissolution, eventually leaving hyaline spheres which fuse into a threadlike mass. The storage-cell nuclei generally retain their normal shape and take a darker stain.

Blight immune, drought tolerant potatoes, D. Reddick (*Amer. Potato Jour., 14 (1937), No. 7, pp. 205–210*).—This contribution from Cornell University is a report of progress in breeding and selection work with species of *Solanum* from Mexico (particularly *S. demissum*) as the blight-immune parents. The problem has been complicated not only by the numerous undesirable characters of the immune parents but also by sterility and incompatibility. The results make it apparent that failures are largely attributable to pollen sterility, since species are usually receptive of pollen from plants which have been found to

have fertile pollen. It is concluded that an inherent capacity to produce mature, viable pollen is emphatically the most important factor in the successful carrying out of a potato-breeding program, and within reasonable limits external conditions do not affect materially the capacity of a plant to produce viable pollen. In this work a considerable number of blight-immune hybrids have been produced which approximate existing types of commercial varieties with respect to such characters as date of maturity, size and shape of tuber, and fleetness of eye. Performance records are given of numerous hybrids and selections obtained, and various desiderata with respect to future progress are critically analyzed.

The Fusarium wilt of potatoes, R. W. Goss (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 60–66*).—In this contribution by the Nebraska Experiment Station the author discusses the salient features of wilt and storage rots due to *F. solani eumartii* and *F. oxysporum*. Tests in Nebraska (3 yr.) averaged a 66-percent stand from infected as against a 92-percent from healthy seed, and infections in the field and in harvested tubers were, respectively, 14 and 19 percent from infected and 3 and 7 percent from healthy seed. Tests with healthy seed on 100 farms indicated considerable infection from the soil, and strong circumstantial evidence was obtained that infection may occur from virgin soils. In soil infections the disease develops slower and is more influenced by environal conditions. In Nebraska more infections of this type are due to *F. solani eumartii*, and they cause the greatest crop damage. Infections via the roots by this species and early-season stem rot by either species usually occur under conditions ideal for the potato plant.

Control presents a difficult problem, but various measures tending to reduce the incidence of infection are enumerated.

The effect of crop rotations on some soil-borne diseases of the potato, R. W. Goss (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 77–84*).—As a result of this study by the Nebraska Experiment Station relative to the effects of rotations on *Rhizoctonia*, *Fusarium* wilt, and scab, it is concluded that the 4- or 6-yr. rotations in which alfalfa precedes potatoes are the most desirable. On more limited data it is believed that the next best rotation is a shorter one in which sweetclover is used. In short rotations, corn is considered undesirable where *Fusarium* is a factor. In short rotations without green manure, the use of barnyard manure increased the yields and lowered the *Rhizoctonia* infection, but scab was increased. Applications of these results to other conditions must be made with reservations, depending on soil and climatic factors.

Potato seed-treatment studies in Wyoming 1932–1936, G. H. Starr (*Wyoming Sta. Bul. 222 (1937), pp. 52, figs. 5*).—The tests were conducted in three localities, using *Rhizoctonia* and scab-infected lots of Bliss Triumph and Cobbler seed potatoes treated with various materials. In size and uniformity of plants, acid mercury ranked first and acid formaldehyde last of the treatments used, but the differences were of doubtful significance. In vigor of plants, no one treatment proved consistently better. None of the treatments used on healthy seed increased the yields significantly, but averaging all yields in all tests, mercuric chloride, acid mercury, Semesan Bel, Mercurnol, and acid formaldehyde gave increases, while hot formaldehyde and formaldehyde dust decreased yields considerably. For effectiveness against scab, no one treatment was consistently better than the others, and all gave some degree of control. Although the average differences between treatments for *Rhizoctonia* were small, acid mercury proved slightly more effective than corrosive sublimate. Averaging all treatments on all seed for disease-free tubers, they ranked in the following order from best to poorest: Mercuric chloride, acid

formaldehyde, acid mercury, Mercurnol, hot formaldehyde, Semesan Bel, and formaldehyde dust, all being considerably above the controls. Although tried only 1 yr., presprinkling gave favorable results. The dusts, as used, were not as effective or practical as the liquids. Detailed results are given of tests with some of the newer short-time treatments in comparison with the standard treatments.

The amount of scab developing under different soil-moisture conditions was not consistent for the 5-yr. period, though the average was greater in the nonirrigated plats. In the fertilizer plats the reverse was true. The yields averaged 75 percent higher on irrigated than on nonirrigated plats. The yields of healthy and of *Rhizoctonia*- and scab-infected seed are compared.

Soil infestation by these parasites was found to be of slight to considerable importance during the 5-yr. period. Treatments of inoculated sulfur, ammonium sulfate, superphosphate, and other fertilizers applied to the soil (irrigated and nonirrigated) were not generally effective in controlling diseases, but ammonium sulfate showed some reduction of scab in the nonirrigated plats.

Effect of seed treatments on seedling emergence, severity of seedling blight, and yield of rice, E. M. Cralley and E. C. Tullis (*Arkansas Sta. Bul. 345 (1937), pp. 24, fig. 1*).—"*Fusarium* spp., *Helminthosporium oryzae*, *Rhizoctonia* sp., and *Curvularia lunata* were the fungi most consistently isolated from diseased rice seedlings. Since, according to previously reported experiments [E. S. R., 76, p. 644], *H. oryzae*, *Trichoconis caudata*, *C. lunata*, *Fusarium* spp., and *Phoma* sp., were found most consistently in discolored rice kernels, the fungi found in association with diseased seedlings, with the exception of *Rhizoctonia* sp., may be seed-borne."

Seedling blight occurred at soil temperatures of 18°–34° C., the most severe pre-emergence blight occurring, in general, at the lower temperature. *H. oryzae* was most active at the lower, *Fusarium* at the higher temperatures.

Supreme Blue Rose seed from the Rice Substation responded favorably at certain dates to formalhehyde, ethyl mercury phosphate, ethyl mercury chloride, and red copper oxide dusts, as indicated by small increases in yields, whereas this variety from Beaumont, Tex., and Fortuna and Caloro from the Rice Substation and Beaumont failed to respond similarly. Seedling emergence was increased and the severity of blighting was in some cases reduced, but the yields were not always increased accordingly. Seed treatments are, therefore, not recommended for seedling blight control in Arkansas until more effective data are available.

Inheritance of resistance to Pythium root rot in sorghum, D. H. Bowman, J. H. Martin, L. E. Melchers, and J. H. Parker (*Jour. Agr. Res. [U. S.], 55 (1937), No. 2, pp. 105–115, figs. 4*).—Cooperative studies by the Kansas Experiment Station and the U. S. D. A. Bureau of Plant Industry of progenies of crosses between varieties resistant or susceptible to infection by *P. arrhenomanes*, grown in infested soil, indicated susceptibility to be partly dominant and determined by a single factor difference, and to be inherited independently of coleoptile color or hybrid vigor.

A greenhouse method for testing resistance to curly top in sugar beets, N. J. Giddings (*Phytopathology, 27 (1937), No. 7, pp. 773–779, figs. 5*).—Seedlings of several beet strains were tested for relative resistance as indicated by percentage infection, severity of symptoms, and incubation period. In each test, plants for inoculation were set in boxes in pairs and the pairs were so arranged that the same number of plants of each strain was in each of the different positions in the boxes. A system is given for grading sugar beets according to severity of curly top symptoms, grade 1 indicating slight, and grade 5 very

severe injury. Highly significant data are given covering work with several strains, but especially with the ordinary commercial brands as compared to the resistant strain U. S. 1. The field data given indicate that the greenhouse method compares favorably with field tests, which require more time and cannot be conducted during cold weather.

Treatment of sugar-beet seed increases stand and yield, E. L. LeClerg (*Minn. Univ. Agr. Ext. Circ. 57 (1937), pp. 7, figs. 2*).—In this study by the U. S. D. A. Bureau of Plant Industry in cooperation with the Minnesota Experiment Station, seed treatment with Ceresan proved effective in experimental and commercial tests in controlling damping-off, the principal cause of poor stands of sugar beets in Minnesota.

Investigations on sugar cane diseases in Louisiana in 1936–37, I–III (*Louisiana Sta. Bul. 288 (1937), pp. 12*).—The following three papers are included:

I. *Losses caused by the mosaic and red rot diseases of sugar cane*, C. W. Edgerton, I. L. Forbes, and P. J. Mills (pp. 3–8).—The results of several years' field tests of various commercial canes and many of the new seedlings with respect to losses from mosaic and red rot are presented in textual and tabular forms. Co. 281 is considered a very valuable cane. Co. 290 was somewhat injured, but its high-yielding characteristics point to its culture in certain sections for some time. The three newer varieties, C. P. 28–11, C. P. 28–19, and C. P. 29–320 met the disease standards satisfactorily. C. P. 29–116 is proving decidedly resistant at present.

II. *Possible migration of spores of red rot fungus in cane stalks*, R. E. Atkinson and C. W. Edgerton (pp. 8–10).—The tests recorded indicate that it is possible for spores of *Colletotrichum falcatum* to travel through the fibrovascular bundles, and suggest strongly that this is what occurs when cut stalks are inoculated at planting time.

III. *Immunity studies with sugar cane mosaic*, I. L. Forbes, P. J. Mills, and C. W. Edgerton (pp. 10–12).—Evidence from the results of crossed superinoculations (with adequate controls) are believed to indicate rather definitely that "(1) the viruses responsible for the yellow and green symptoms are distinct; (2) that both viruses do not occur in the same plant; and (3) that a plant affected by one virus is rendered immune to the other one."

Relation of Stanley's crystalline tobacco-virus protein to intracellular crystalline deposits, H. P. Beale (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 413–431, figs. 6*).—The author reports the isolation of Stanley's crystalline tobacco virus protein from species of *Nicotiana*, *Solanum*, and *Petunia* and from streak virus extract (a combination of potato X and tobacco virus). The use of the serum-precipitin reaction in detecting the possible presence of inactive potato X virus in a solution of tobacco virus protein is demonstrated. Experiments with antiserum to streak extract are described, from the results of which it is concluded that the specificity of the precipitin reaction for the two viruses is not altered by multiplication of potato X and tobacco virus simultaneously in the same plant. Crystalline deposits, associated with chlorosis and present in the living mosaicked cell, and the transformation of the crystalline plates into needle crystals by the addition of dilute acid or salt to the aqueous mount of living diseased tissue are fully described and illustrated. Transformation of the crystalline plates into needles is reported for all hosts studied, viz, *N. tabacum* (Turkish and White Burley), *Petunia*, tomato, *Capsicum*, and *S. nigrum nodiflorum*. These plates may be more complex chemically than Stanley's crystalline tobacco virus protein.

"It is concluded that the intracellular crystalline deposits are the source of Stanley's crystalline tobacco virus protein, because (1) the two crystalline compounds are present in large amounts, (2) there is a striking similarity in the gross appearance of the needles precipitated in the cell and isolated from virus extract, [and] (3) the acidity and alkalinity at which Stanley reports denaturation of the protein corresponds closely to the reactions at either end of the pH range at which the intracellular crystals go into solution and are not subsequently recrystallizable. It is concluded that concentration is an important factor in the intracellular crystallization of tobacco virus protein."

Modifications of cell structure in "halo wildfire" and "epidemic wildfire," J. Dufrénoy (*Phytopathology, 27 (1937), No. 7, pp. 792–796, figs. 5*).—Halo wildfire develops around needle-prick inoculations of *Bacterium tabacum* [=*Phytomonas tabaci*] or spontaneous penetration into cells of tobacco leaves crushed by the impact of large raindrops or hailstones, under which conditions the bacterial toxin diffuses while the bacteria are hindered from rapid swarming into the living cells. Cells around the infection court remain turgescent, though their chloroplasts undergo disintegration under humid and cloudy conditions. These cells accumulate phenolic compounds which oxidize into red compounds as the cells collapse under bright sunshine. Epidemic wildfire results when *B. tabacum* develops zoogloene in water-soaked tissues following storms or experimental spraying. Infected tissues finally collapse and turn brown when exposed to sunshine.

Seed transmission of tomato mosaic following the planting of freshly extracted seed, S. P. Doolittle and F. S. Beecher (*Phytopathology, 27 (1937), No. 7, pp. 800, 801*).—Tomato seed was extracted from fruits of plants affected either with ordinary tobacco mosaic (tobacco virus 1) or with streak disease caused by combined infection with tobacco virus 1 and X-virus of potato. When planted in sterilized soil in the greenhouse within 8 days after extraction, 14 of 506 plants from seed of mosaicked fruits and 11 of 240 plants from seed of streaked fruits showed mosaic symptoms in the cotyledons and first leaf, whereas 523 control plants from seed of normal plants remained healthy. Seed from mosaicked or streaked plants were also stored for 3–12 mo. before planting and grown under the above conditions. These tests included 3,567 plants from infected fruits, 19 of which showed mosaic after developing 4–6 leaves, whereas 937 controls remained healthy. None of the plants in any trial showed evidence of the potato virus. In view of the late appearance of mosaic symptoms in the plants grown from stored seed, it is believed that this infection cannot be definitely attributed to seed transmission. When seed is planted immediately after extraction, it is believed there is a definite possibility of severe transmission of the mosaic virus.

Environmental conditions influencing the development of tomato pockets or puffs, A. C. Foster and E. C. Tatman (*Science, 86 (1937), No. 2218, pp. 21, 22*).—The most important conditions within the plant that appeared to contribute to the trouble were (1) no fertilization of ovules or typical parthenocarpy, (2) ovule or embryo abortion after normal fertilization, and (3) necrosis of vascular and placental tissue after fruit growth is well developed. These may result from the interrelation and interaction of environmental factors such as soil moisture, soil nutrition, air temperature, and light duration, any one of which may become a limiting factor to normal plant growth, metabolic and respiratory activity, causing a condition of suboxidation or endoxerosis, and affecting the CO_2 and O_2 exchange, resulting in a visible necrosis of the vascular and placental tissues, and affecting ovule and embryo and placental development and normal fruit growth.

The shot-hole disease of stone-fruit trees, E. E. Wilson (*California Sta. Bul. 608 (1937), pp. 40, figs. 13*).—The history and symptoms of infections by *Coryneum beijerinckii* are given, and the importance of the disease on the various organs in relation to control procedures is discussed. The known hosts are listed, peach, nectarine, almond, and apricot being those suffering most consistent losses in California. The fungus is described, and the spores and spore-bearing organs are illustrated. It survives unfavorable summer conditions in peaches as mycelium in the twig and bud tissues and as conidia in the buds; in almonds it is carried over as mycelium in twigs, as mycelium and spores in dormant buds, and to some extent as mycelium and spores in persisting blossoms; and in apricots the hold-over sources are the blighted dormant buds. Rain is considered the most important factor in spreading the fungus about the trees. The time between infection and appearance of symptoms is 5–8 days in leaves and 7–20 days in twigs, but climatic variations influence the development of the disease.

The spray tests were designed to determine the most effective materials and schedules, particularly for almonds and peaches. Lime-sulfur, Basicop, Coposil (suspended in water or oil), Coprol, and Avon proved less effective than bordeaux mixture (5–5–50 or 6–6–50). In one peach orchard, addition of a dormant-type oil emulsion (4 gal. per 10 gal. of spray) to bordeaux mixture gave a slightly but consistently better control of twig infection. In almonds blighted dormant buds and diseased blossom parts appeared to be the most important sources of infection, and applications preventing development on these parts gave the best control of leaf infection. In peaches, the sprays preventing twig infection most effectively also gave the greatest control of leaf infection. A study of the weather-resisting quality of the sprays indicated that the amount of copper remaining on the twigs bears a direct relation to efficiency in controlling twig infection. The weathering of the bordeaux coating seems to be the reason why early-fall spraying prevented twig infection less effectively than later applications. Detailed recommendations are given. For almonds, the time just before the blossom buds begin to swell seems to be most important. The secret of good control in both apricots and peaches is thorough and consistent spraying year after year. In both almonds and peaches, spraying should be supplemented with removal of all diseased parts from the trees. The bibliography includes 34 references.

Report on phony peach disease control, Tennessee, A. E. Cavanagh (*Tenn. State Hort. Soc. Proc., 32 (1937), pp. 48–53*).—The disease has been known in the United States for 50 yr. or more, and by 1929 had spread to such an extent that it was taking a heavy toll annually. The recently expanded control program is outlined, including the removal of escaped and abandoned trees in 11 States, which has eliminated a difficult and dangerous source of this virus disease and also of other major peach pests. Inspection and eradication in and around nurseries and of diseased trees in the lightly infected States, extensive surveys, complete grove and yard inspection, and extensive eradication in established eradication areas in the noncommercial States of Louisiana and Mississippi are also included in the program.

Movement of intracellular bodies associated with peach yellows, A. Hartzell (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 375–388, figs. 6*).—Movement of intracellular bodies found by the author associated with peach yellows was recorded cinematographically in the cells of living leaf petiole, style hair, and root hair tissues, as contrasted with apparently healthy tissues in which such bodies were absent or rare. Similar appearing bodies were found and photographed in cells of the intestinal wall and salivary glands of the lin-

ing vector *Macropsis trimaculata* fed for 1-3 weeks on affected trees, but not in leafhoppers fed on healthy trees. A parallel relationship seemed to exist with the aster yellows and its vector. In general, there was much more cellular disturbance in infected plants and insects than was found in corresponding normal tissues.

When infected tissue was crushed on slides and the bodies were released into the cell juice, those from infected leaf petioles and from the digestive system of infected leafhoppers showed marked motility. Infected style hairs in a hanging drop culture showed motile intracellular bodies and streaming cytoplasm but after a current of gas made up of 60 percent CO_2 and 20 percent oxygen was passed through the cell both the movement and the streaming ceased. These movements were restored on passage of air through the cell. Solutions made up of nonliving material similarly treated showed no effect on the Brownian movement, suggesting another mechanism for the movement of the intracellular bodies.

The Maynard plum—a carrier of the peach mosaic virus, E. W. Bodine and L. W. Durrell (*Science, 86 (1937), No. 2221, p. 81*).—From budding and root-grafting experiments it appears that plums can be carriers of the peach mosaic virus, though the trees do not show the symptoms evident in the peach.

An investigation of strawberry virus disease in Ontario, R. V. Harris and A. A. Hildebrand (*Canad. Jour. Res., 15 (1937), No. 6, Sect. C, pp. 252-280, pls. 4, figs. 4*).—"Observations in the field and greenhouse [at St. Catharines], confined largely to the varieties Parson's Beauty, Premier (Howard 17), Forward, and Glen Mary, showed that symptoms analogous to those of yellow-edge in England and sufficiently defined to permit of diagnosis were apparent only on Parson's Beauty and Forward, and then only for a limited period early in the growing season. In the 1933-35 transmission experiments (by runner grafting), symptoms macroscopically indistinguishable from those of typical yellow-edge-infected plants in England were induced on Royal Sovereign from the local varieties Glen Mary, Parson's Beauty, and Premier, which possess markedly the sypmtomless-carrier capacity. Of special interest was the deterioration of Premier components in certain graft series, the evidence suggesting reciprocal infection between test and indicator plants.

"Finally, parallel experiments at the East Malling Station in 1935-36 provided supplementary data as follows: (1) Of the two parent *Fragaria* species common to commercial varieties in North America and in England, *F. chiloensis* was found to be a symptomless carrier of yellow-edge with a high order of resistance, and *F. virginiana*, in complete contrast, exhibited symptoms with extreme readiness, together with high susceptibility, thus providing some explanation of the observed wide range of varietal reaction to disease of the yellow-edge type. (2) A large proportion of the clone of Royal Sovereign plants used as 'normal' indicators in the recent series of experiments was found to be infected with a distinct virus of the 'crinkle' type, thus providing explanation of an observed reciprocal reaction in certain series with the Premier variety."

Histological studies on wilt of China aster, A. J. Ullstrup (*Phytopathology, 27 (1937), No. 7, pp. 737-748, figs. 5*).—The normal and pathological anatomy of varieties of China-asters resistant and susceptible to wilt was studied. The resistant variety, obtained through several years of selection, proved to be about 90 percent resistant. The susceptible varieties, obtained through commercial sources, were practically 100 percent susceptible. Anatomically, the roots of healthy resistant plants were indistinguishable from those of healthy susceptible plants. Penetration of the susceptible roots by *Fusarium conglutin-*

ans callistephi occurred between cells of the root cap, between epidermal cells in the region of elongation, and, occasionally, directly through an epidermal cell. Initial penetration via the root hairs was not observed. Little penetration was found in the roots of the resistant variety, and when the hyphae penetrated the roots their subsequent development was much retarded. Since no morphological barriers to the fungus were found in resistant roots, it is concluded that resistance is due to the physiological nature of the host protoplast.

Penicillium rot of lily bulbs and its control by calcium hypochlorite, K. O'Leary and C. E. F. Guterman (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 361–374, fig. 1*).—The United States at present imports from Japan most of the lilies grown under glass or out of doors, and with some of the species imported a *Penicillium* bulb rot has for many years caused serious losses. This study indicated that the causal fungus apparently belongs to the *P. cyclopium* Westling group.

In experiments conducted for 6 yr. on bulbs of *Lilium auratum*, using present commercial methods of handling except for the treatments, sulfur dust, copper-lime dust, formaldehyde in liquid and dust forms, and borax used as a dip gave poor control. Plain and copper- or mercury-treated wrappers and removal of the roots before packing the bulbs proved ineffective. Organic and inorganic mercury dusts were fairly effective, but the mercury compounds, in general, proved very toxic to the lilies under the test conditions. Naphthalene flakes gave good control but caused bulb discoloration. Calcium hypochlorite powder (20–27 percent available chlorine) mixed with the packing soil at the rate of 160 g to 50 lb. of soil gave excellent control of both the rot and the bulb mite *Rhizoglyphus echinopus* without injury to the bulbs or the plants grown from them.

Observations on psorosis of citrus trees in Florida, A. S. Rhoads (*Citrus Indus., 18 (1937), No. 5, pp. 8, 9, 16, 17*).—This contribution by the Florida Experiment Station summarizes present information on psorosis (the history of the disease, its symptoms and course, its etiology, the injury caused, and control measures), including studies over a period of years by the author. The results of two surveys (1927 and 1936) of a block of 306 orange trees, as here tabulated, indicate the disease to have disappeared from 9 trees and to have made its appearance on 14 additional trees during this 9-yr. period—a very slow rate of increase. Surveys of a row of grapefruit trees showed a comparable rate of progress. New cases appeared sporadically without any apparent tendency to localization as focuses of infection, and there was no evidence of psorosis on trees set to replace those removed because of the disease. The bark-scraping method of control has proved effective except where the disease has apparently become systemic.

The Dutch elm disease: A new threat to the elm, M. A. McKenzie and W. B. Becker (*Massachusetts Sta. Bul. 343 (1937), pp. 16, figs. 9*).—The expressed object of this bulletin is to present to the people of the State the essential facts concerning the disease and the causal fungus, the means of dissemination, and the methods of control.

Cephalosporium canker of balsam fir, C. M. Christensen (*Phytopathology, 27 (1937), No. 7, pp. 788–791, figs. 2*).—Through this study by the Minnesota Experiment Station a hitherto undescribed canker of balsam fir, found in natural stands at several localities in Minnesota and Wisconsin, is shown to be due to *Cephalosporium* sp. The oval or elliptical cankers originate most frequently at branch stubs, are slightly sunken with no very definite border, and the diseased inner bark is brown. Following inoculation of trees with pure

cultures of the fungus, cankers up to 12 in. long developed within a year.

Further studies on the interrelationship of insects and fungi in the deterioration of felled Norway pine logs, J. G. Leach, L. W. Orr, and C. Christensen (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 2*, *pp. 129–140*, *figs. 8*).—In this contribution from the Minnesota Experiment Station, the changes occurring in felled logs during the second and third years after felling were studied. During this period, the entire sapwood and a considerable portion of the heartwood in fully exposed logs became decayed, *Peniophora gigantea* proving primarily responsible.

No evidence of dependence on insect dissemination or ingression was obtained, the fungus apparently being disseminated readily by wind and able to enter through cracks in the bark or holes made by insects. The decay develops very rapidly in the sapwood, but more slowly in the heartwood. Its spread in the heartwood is especially slow radially and tangentially but more rapid longitudinally.

Several insect species were found in the logs during the period, two cerambycids (*Monochamus scutellatus* and *M. notatus*) and two buprestids (*Chrysobothris dentipes* and *Chalcophora virginiensis*) being the most prevalent wood-boring beetles. There was a fair degree of correlation between the number of cerambycids in the logs and the amount of heartwood decayed. Their larvae appeared to hasten decay by facilitating radial and tangential invasion of the heartwood by *P. gigantea*, the open larval tunnels being especially favorable for its spread. The buprestids had little influence on the rate of heartwood decay, their closed tunnels apparently being less suited for its spread. Other species inhabiting the bark and outer sapwood layers appeared to have but little influence on wood decay.

Studies in wood decay.—VI, The effect of arsenic, zinc, and copper on the rate of decay of wood by certain wood-destroying fungi, F. Kaufert and H. Schmitz (*Phytopathology*, *27* (*1937*), *No. 7*, *pp. 780–788*, *fig. 1*).—In tests by the University of Minnesota, the addition of low concentrations of arsenic trioxide to Norway pine sawdust appeared definitely to stimulate its decay by *Lenzites trabea* and by *Lentinus lepideus*, while even the lowest concentration tested (50 p. p. m.) appeared to be toxic to *Trametes serialis* and *Polyporus anceps*. Zinc chloride at 100–400 p. p. m. appeared to increase the rate of decay of Norway pine sapwood sawdust by *Lenzites trabea* and *Lentinus lepideus*, while concentrations above 400 p. p. m. appeared definitely toxic to both fungi. The results with $CuSO_4$ proved inconclusive insofar as showing a significant increase in the rate of decay of Norway pine sapwood by *Lenzites trabea* and *Lentinus lepideus* is concerned. It appears that *L. lepideus* is considerably more resistant to $CuSO_4$ than *Lenzites trabea*, but the latter is far more resistant to arsenic trioxide than the former.

The significance of certain wood-destroying fungi in the study of the enzymatic hydrolysis of cellulose, I. W. Bailey and M. R. Vestal (*Jour. Arnold Arboretum*, *18* (*1937*), *No. 3*, *pp. 196–205*, *pls. 2*, *figs. 3*).—"There are certain fungi whose hyphae perforate and move forward within the secondary walls of tracheary cells and fibers. The cavities produced by these fungi are of two geometrical forms, i. e., (1) cylindrical with conical ends or (2) biconical, and are of remarkably constant angularity, regardless of the particular group of gymnosperms or angiosperms in which they occur. It is evident that the enzymatic activity of these fungi progresses along two predetermined sets of planes, (1) oriented parallel to the long axis of the fibrils and chain molecules of cellulose and (2) at an angle of from 20°–25° to this axis. These fungi evidently are ubiquitous forms which attack the vascular

and fibrous tissues of the higher plants when they are cut and are exposed to the air. The fungi are so significant from experimental and physicochemical points of view that an effort should be made to isolate them, to grow them in pure cultures, and to determine their identity."

Proceedings of the root-knot nematode conference, held at Nashville, Tennessee, Feb. 2 and 3, 1937, edited by H. P. Barss, S. A. Wingard, E. M. Buhrer, G. Steiner, and J. Tyler (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 102, pp. 97–122, fig. 1*).—This contribution outlines the organization of the conference; gives a digest of its program, including general facts about *Heterodera marioni*, its hosts, artificial culture methods, parasites and other enemies of the nematode, responses to environal factors, methods of determining and measuring infestations, dissemination, temperature relations in Florida, control tests in Florida with fertilizers, chemicals and culture methods, chemical control studies, a general discussion of crop rotation with resistant plants, development of root knot resistant varieties of crop plants, elimination of root knot infestation from plants, a special discussion of nematode hosts, and the nematode in relation to other plant parasites; and presents some of the objectives of the root knot nematode program, including a nematode survey, suggested lines for investigation, procedures for increasing the effectiveness of attack on the problem, and a general discussion of organization for future work.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Post-mortem examinations of wild birds and mammals, J. E. Shillinger and W. Rush (*U. S. Dept. Agr., Misc. Pub. 270 (1937), pp. 16, figs. 6*).—This account was prepared with a view to assisting field workers in noting abnormal conditions and helping to eradicate them through reports of observations to wildlife disease-control specialists.

Summer food habits of the badger in northwestern Iowa, P. L. Errington (*Jour. Mammal., 18 (1937), No. 2, pp. 213–216*).—Studies made by the Iowa Experiment Station during the summer of 1936 on the badger (*Taxidea taxus*) population of a 392-acre tract of reverting prairie, a few miles north of Ruthven, are reported upon.

Tagging studies of red foxes, P. L. Errington and R. M. Berry (*Jour. Mammal., 18 (1937), No. 2, pp. 203–205*).—The results of tagging operations conducted during 1933 and 1934, in which several hundred foxes (*Vulpes fulva*) were taken from dens upon the complaint of farmers, are reported upon in this contribution from the Iowa Experiment Station.

Insect food of skunks, G. H. Kelker (*Jour. Mammal., 18 (1937), No. 2, pp. 164–170*).—Data and material collected during the years 1929, 1930, and 1931 on a wildlife sanctuary located in the southeastern part of Michigan, where both game birds and predators were common, are reported upon. In 1929 insects comprised 67.8 percent of the food of the skunk (*Mephitis nigra*), in 1930 53.5 percent, and in 1931 70.1 percent. In 1929 the injurious insects comprised more than half of the total insect food, in 1930 about three-eighths, and in 1931 98 percent.

The study shows that the kinds of insect foods eaten during the early part of the summer are of equal value, but during the later summer the injurious species predominate. Therefore, the economic value of the skunk on this wildlife sanctuary, when based solely on insect food, is doubtfully positive in the early part of the season, but decidedly positive for the late summer and fall.

Thirteen-lined ground squirrel feeds on white grubs, L. E. Yeager (*Jour.

Mammal., 18 (1937), No. 2, p. 243).—In observations during June and July 1936 in the Huron National Forest, northeastern lower Michigan, the author found *Citellus tridecemlineatus tridecemlineatus* to feed readily on the live grub forms of June and related beetles. Among those identified were larvae of *Cotalpa lanigera*, *Aphonus tridentatus*, and several species of the genus *Phyllophaga*. Other species were eaten.

Ruffed grouse management, R. T. King (*Jour. Forestry*, 35 (1937), No. 6, pp. 523–532, fig. 1).—Management measures which led to an increase of ruffed grouse through the reduction of mortality on existent ranges and the creation of additional satisfactory ranges, conducted over a period of 7 yr., are reported upon.

Studies in the life history of the song sparrow, I, M. M. Nice (*Linn. Soc. N. Y., Trans.*, 4 (1937), pp. VI+247, pls. 3, figs. 32).—This is a report of studies of the biology of *Melospiza melodia*, together with a bibliography of 14 pages and subject and species indexes.

Insect development analyzed by experimental methods: A review, I, II (*Jour. N. Y. Ent. Soc.*, 45 (1937), Nos. 1, pp. 1–60, figs. 4; 2, pp. 149–210, figs. 2).—Part 1 of this review, on the embryonic stages, by A. G. Richards, Jr., and A. Miller, is presented with a 7-page list of references to the literature, and part 2, on the larval and pupal stages, by A. G. Richards, Jr., with a 10-page list of references.

The relations of some native insects to introduced food plants, H. M. Hefley (*Jour. Anim. Ecol.*, 6 (1937), No. 1, pp. 138–144).—A study of the biota of the Canadian River flood plain in Oklahoma showed that two introduced species, tamarisk (*Tamarix gallica*) and sweetclover (*Melilotus alba*), are important factors in community succession in that area. Thirteen species of native insects apparently show a preference for these introduced plants rather than for their original food, and are associated in large numbers with them.

Gladiolus insects in Iowa, H. D. Tate and M. E. Poos (*Iowa Sta. Bul.* 359 (1937), pp. 20, figs. 19).—A practical summary of information on insect enemies of gladiolus, particularly as relates to the gladiolus thrips and means of its control (pp. 3–13).

Annotated list of the insects and mites associated with stored grain and cereal products, and of their arthropod parasites and predators, R. T. Cotton and N. E. Good (*U. S. Dept. Agr., Misc. Pub.* 258 (1937), pp. 81).—The first part of this annotated list takes up the major pests, 10 in number; minor pests, 41 in number; incidental pests, 142 in number; and associated insects and other arthropods, 143 in number, giving information as to their common name, if any, distribution, habitat and food, and parasites and predators, and in addition the more important references relating to the incidental and associated insects. A systematic list of the species considered, a list of 221 references to the literature cited, and an index of the species considered, follow.

[Work in economic zoology and entomology by the Arizona Station] (*Arizona Sta. Rpt. 1936, pp. 49–52, 86, 87*).—A brief report is made of the work of the year (E. S. R., 76, p. 65), including range rodent investigations; spraying for the control of *Toumeyella mirabilis* on mesquite; range grasshoppers; and a new gall midge of watermelons (*Itonida citrulli*) (E. S. R., 74, p. 374).

[Work in economic entomology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 54, 55, 83, 90, 94–106*).—The work of the biennium reported (E. S. R., 73, p. 68) includes orchard spraying investigations, by R. J. Barnett, W. F. Pickett, and G. A. Filinger; bee investigations, by R. L. Parker; the relation of climate to injurious insects, by R. C. Smith; distribution of the hessian fly in Kansas and its seasonal history around Manhattan, the wheat-stem mag-

got, wheat strawworm, chinch bugs in wheat, and control of underground insects affecting wheat, all by R. H. Painter and H. R. Bryson; corn earworm, corn leaf miner *Cerodontha dorsalis* Loew, corn blotch leaf miner, and chinch bugs in corn, all by D. A. Wilbur and Bryson; the progress of work with insects affecting fruit and redbud, by Parker and P. G. Lamerson, the roots of staple crops, by Bryson, and alfalfa, grasses, and allied plants, by Smith and Wilbur; the biology and control of the strawberry leaf roller and life history and control studies of the strawberry sawfly *Harpiphorus maculatus* Nort., by Parker and Lamerson; and the resistance of sorghums and corn to chinch bugs, corn to corn earworm, wheat to hessian fly, and alfalfa to pea aphids, by Painter and Parker.

[Contributions on economic insects and acarids in Kansas] (*Kans. State Hort. Soc. Bien. Rpt., 43 (1934–35), pp. 48–82, 88–101, figs. 2*).—Contributions made on insect control here presented include the following: The Relation of Codling Moth Bait Traps to Proper Spray Dates, by P. G. Lamerson (pp. 48–53), Substitutes for Arsenate of Lead Used as Sprays for Codling Moth Control During the Season of 1934 (pp. 54–59) and the Season of 1935 (pp. 60–63), both by R. L. Parker and P. G. Lamerson, Chemically Treated Codling Moth Bands, by G. A. Filinger (pp. 64–68), and The [Common] Red Spider and the Clover Mite, by G. A. Dean (pp. 98–101), all contributed from the Kansas Experiment Station; New Developments in Oil Sprays in Control of Codling Moth, by C. R. Cleveland (pp. 68–82); Results of Field Tests of Organic Substitutes for Lead Arsenate, by H. Baker and H. G. Butler (pp. 88–94); and The [Common] Red Spider on Apples, by H. Baker (pp. 94–98).

[Work in entomology by the New Hampshire Station] (*New Hampshire Sta. Bul. 296 (1937), pp. 16, 17*).—Brief reference is made (E. S. R., 75, p. 512) to work by W. C. O'Kane, J. G. Conklin, L. C. Glover, and W. A. Westgate with contact insecticides (see p. 75) and on the occurrence of bark beetles and the blueberry spanworm *Itame inceptaria*, an outbreak of the Surinam roach, and an attack on delphinium plants by the broad mite.

[Entomological contributions] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 2, pp. 103–200, 225–247, pls. 4, figs. 13*).—The contributions here presented are: Observations of Some Insects Associated With Sugarcane in Puerto Rico, by F. M. Wadley (pp. 103–114); Notes on the Changa, or West Indian Mole Cricket, in Puerto Rico in 1935 and 1936, by A. H. Madden (pp. 115–120); Descriptions of Miscellaneous Chalcidoid Parasites From Puerto Rico (Hymenoptera), by H. L. Dozier (pp. 121–135); The Mosquitoes of Puerto Rico, by G. S. Tulloch (pp. 137–167); Damage to Sea Island Cotton by the West Indian Blister Mite (*Eriophyes gossypii* Banks) in Puerto Rico, by L. C. Fife (pp. 169–177); New or Little-Known Species of West Indian Tipulidae (Diptera)—II, by C. P. Alexander (pp. 179–190) (E. S. R., 77, p. 222); Studies in the Entomophthoraceae—I, Observations on the Genus *Conidiobolus*, by A. G. Kevorkian (pp. 191–200); A Revision of the West Indian Races of *Loxigilla noctis* (Linnaeus), by S. T. Danforth (pp. 225–232); Status of the Pink Bollworm in Puerto Rico During 1935–36, by L. C. Fife (pp. 233–235); and The Introduction of Parasites of the Sugarcane Borer Into Puerto Rico (pp. 237–241) and The Importation of Coccinellid Enemies of Diaspine Scales Into Puerto Rico (pp. 243–247), both by S. M. Dohanian.

[Contributions on economic insects and their control] (*Peninsula Hort. Soc. [Del.] Trans., 50 (1936), pp. 24–26, 40–54, 60–77, figs. 5*).—Contributions on economic insects (E. S. R., 76, p. 823) are Pea Aphis Control in Maryland, by E. N. Cory and C. Graham (pp. 24–26); Insects and Diseases Commonly Encountered on Strawberries, by G. S. Langford and E. J. Anderson (pp. 40–46)

(Md. Experiment Station); The Spray Injury Problem, by F. J. Schneiderhan (pp. 47–54) (W. Va. Station); The Codling Moth—A Nation-Wide Problem, by B. A. Porter (pp. 60–67); and The Influence of Lead Arsenate and Lime on the Fungicidal Toxicity and Adherence of Wettable Sulfur Sprays, by J. W. Heuberger and J. F. Adams (pp. 68–72), and Control of Codling Moth in 1936, by L. A. Stearns, H. G. Guy, and J. B. Schmitt (pp. 73–77) (both Del. Station).

Technique of large-scale operations in pest control, S. B. Fracker (*Ent. Soc. Wash. Proc., 39 (1937), No. 3, pp. 41–58*).—This contribution, presented as a presidential address of the Entomological Society of Washington in January 1937, is accompanied by a list of 19 references to the literature.

***New records from bait traps* (Dipt., Coleop., Corrodentia),** S. W. Frost (*Ent. News, 48 (1937), No. 7, pp. 201, 202*).—In this contribution from the Pennsylvania Experiment Station, record is made of species attracted to bait traps additional to those reported upon earlier (E. S. R., 76, p. 510).

Immunity of certain insects to selenium poisoning, S. F. and H. M. Trelease (*Science, 85 (1937), No. 2216, p. 590*).—Observations are reported in which weevils (*Acanthoscelides fraterculus*) and seed chalcids (*Bruchophagus mexicanus*) were found to complete their life cycles in the seeds of *Astragalus bisulcatus* (one of the most poisonous of the range plants), containing 1,475 p. p. m. of selenium.

Influence of different materials on coverage and adhesiveness of sprays and their effect on residue removal from apples, A. L. Weber, H. C. McLean, B. F. Driggers, and W. J. O'Neill (*New Jersey Stas. Bul. 627 (1937), pp. 16*).—A survey made in 1934 of approximately 50 commercial orchards of the State to determine the efficiency of the widely different spraying methods used developed that much less arsenic was deposited in the upper portion than in the lower portion of the trees, and that a high percentage of the spray deposit disappeared during the intervals between spraying, particularly from the top foliage. This led to field work during 1935 and 1936 in which a comparison was made of various spray compounds to determine their relative effect on the deposition and retention of residue and on spray residue removal from harvested fruit. These treatments differed essentially only in the materials used as stickers, which were as follows: Summer-oil emulsion, skim milk powder, bentonite sulfur, fish oil, fish-oil soap, sulfonated castor oil, bentonite, precipitated ferric hydroxide, and an aromatic sulfonate.

"The most effective stickers were summer-oil emulsion, bentonite sulfur, and milk. These materials not only caused greater initial deposit of arsenic, but, at the end of the 10-day weathering period, gave greater retention of arsenic. Contrary to expectation, pure bentonite resulted in the lowering of the deposition of spray and gave no greater retention in the check plat. The remaining agents showed little build-up or retention effect over the check plat. Not only the total amount of precipitation for a given period was shown to affect the retention of spray residues but also the amount of rainfall received at each rain. With or without a sticking agent, one rain of 2.29 in. will remove, by washing, more residue than nine small rains totaling 2.49 in. The efficiency of these different sticking agents was compared on the fruit itself. Analyses were made prior to, immediately after, and 10 days after the 67-day spray. Although the amount of arsenic deposited and retained differed from that retained on the leaf, stickers displayed the same relative effects. It is evident from the results that analyses of the leaf not only suffice, but also largely remove the growth factor in investigations of this type. Similar tests were conducted on the deposition and retention of sulfur. Marked differences

were noted in the reaction of various stickers to sulfur and arsenic. Of the stickers tested, dry skim milk proved most effective in the deposition and retention of sulfur. No sticker treatment caused appreciable difficulty in the removal of lead and arsenic residues from the fruit at time of harvest."

Studies of contact insecticides.—XII, The performance of certain contact agents on various plant surfaces, W. C. O'Kane, L. C. Glover, and W. A. Westgate (*New Hampshire Sta. Tech. Bul. 68 (1937), pp. 22, figs. 20*).—The work here reported (E. S. R., 76, p. 503) summarizes the results of a series of studies in which the contact angles (at 15 sec.) of 7 contact agents on 9 species of plant leaf and 7 species of plant stem were measured. Paraffin-coated glass slides and two species of insect were used for comparison. Surface tensions were measured. The details of the work are presented in table and graph form.

"The materials studied gave definite variations in contact angles on the various plant surfaces. Calcium caseinate and saponin, with few exceptions, gave high angles. Gardinol and potassium coconut oil soap exhibited low angles on some plant surfaces and high angles on others. Sodium oleate, triethanolamine oleate, and monoamylamine oleate exhibited low angles on nearly all of the plant surfaces used. The exact nature of a leaf surface or stem surface is of evident importance in the performance of a contact agent."

Oil-nicotine, a promising new insecticide, P. O. Ritcher and R. K. Calfee (*Kentucky Sta. Bul. 370 (1937), pp. 45–60, figs. 4*).—A somewhat more detailed account (E. S. R., 77, p. 69) of work which has shown free nicotine dissolved in highly refined petroleum distillate to give promise as a horticultural spray.

On the penetration of certain arsenical compounds into the body of the American cockroach (Periplaneta americana (L.)), L. C. Glover (*Iowa State Col. Jour. Sci., 11 (1936), No. 1, pp. 57–59*).—It was found that arsenic as a dry powder will penetrate through the integument of the American cockroach when applied either as an arsenious oxide or as sodium arsenite. When rather high concentrations are built in the insect body, arsenic may be recovered in all parts and tissues. Such concentrations were found when sodium arsenite was employed as the toxicant. When the less soluble arsenious oxide was used, the distribution of the arsenic was practically limited to the digestive tract and to parts and tissues near the point of application.

Seasonal succession, soil relations, numbers, and regional distribution of northeastern Texas acridians, F. B. Isely (*Ecol. Monog., 7 (1937), No. 3, pp. 317–344, figs. 6*).—The accumulated data from field and experimental notes pertaining to seasonal succession, general soil relations, relative numbers of the more populous northeastern Texas short-horned grasshoppers, and regional distribution within northeastern Texas, based upon studies conducted during the years 1931–36, are summarized in this contribution. A list is given to 40 references to the literature.

An ecological study of a thrips (Aptinothrips rufus) and its nematode parasite (Anguillulina aptini), A. M. Lysaght (*Jour. Anim. Ecol., 6 (1937), No. 1, pp. 169–192, figs. 7*).—*A. aptini* is a nematode parasitic on *A. rufus* Gmel., a thrips that is abundant on grass plats at the Rothamsted Experimental Station. The contribution deals with its biology, variation in numbers of the host insect, and difference in the percentage of parasitism on grass plats. A list of 28 references to the literature is included.

Resistant varieties of sorghum and corn in relation to chinch bug control in Oklahoma, R. O. Snelling and R. G. Dahms (*Oklahoma Sta. Bul. 232 (1937), pp. 22, figs. 9*).—Data collected in the field from 1930 to 1936 and in the laboratory during 1935 and 1936 at Lawton and observations made on many farms

throughout the State, in cooperation with the U. S. D. A. Bureaus of Plant Industry and Entomology and Plant Quarantine and the Kansas Experiment Station, are reported upon. It is pointed out that, while the results obtained from the experiments and observations are promising, the development of a variety of corn or sorghum entirely immune to chinch bug damage does not appear likely, for when the plants are small or the infestations are extremely heavy all varieties will be damaged. The resistant varieties suffer less damage, however, than those which are more susceptible. The use of resistant varieties of plants adapted to those parts of the State that are frequently and heavily infested with chinch bugs is the most promising method for reducing the damage in Oklahoma. "The adaptation of a corn variety to Oklahoma conditions is an important factor in the chinch bug resistance of the variety. Hays Golden is well adapted to Oklahoma and was the most dependable of all corn varieties tested. This variety is especially recommended for the western part of the State. Hybrid strains of corn have suffered less chinch bug damage than their inbred parents. . . .

"Sorghum varieties differ greatly in their ability to withstand drought and chinch bug attack. The degree of resistance among the varieties tested has ranged from very resistant to highly susceptible. Atlas sorgo, a cross between Blackhull kafir and Sourless sorgo, is highly resistant to chinch bug and drought injury and is well adapted to Oklahoma conditions. Several varieties of kafir, such as Dawn Selection, Weskan, Pink, Sharon, and Reed, have shown considerable resistance. Varieties of feterita, milo, and milo derivatives tend to be susceptible. Chinch bugs attack sorghums during any part of the vegetative period, but older and less tender plants are better able to withstand the attack. Plants in the earlier plantings have been largest at the time the chinch bugs migrated to the field, and consequently showed less injury and produced highest yields. Late sorghum plantings are frequently destroyed by chinch bugs. In sections of the State where chinch bugs do not damage sorghum, the highest yields are often obtained from plantings that are made relatively late."

An undescribed chinch bug from Iowa, F. Andre (*Iowa State Col. Jour. Sci., 11 (1937), No. 2, pp. 165–167, pl. 1*).—As a contribution from the Iowa Experiment Station, a description is given of a chinch bug under the name ***Blissus iowensis*** n. sp., found overwintering in samples of little bluestem (***Andropogon furcatus***) near Creston, Union Co., Iowa.

The genera and genotypes of Tingitoidea of the Western Hemisphere, C. J. Drake and M. E. Poor (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 381–390*).—The genera and genotypes of Tingitoidea occurring in the Western Hemisphere are cataloged in this contribution.

Types of vegetation in the San Joaquin Valley of California and their relation to the beet leafhopper, R. L. Piemeisel and F. R. Lawson (*U. S. Dept. Agr., Tech. Bul. 557 (1937), pp. 28, figs. 14*).—Investigations have shown that in spring at the time of the drying of winter annuals on the range lands of the western side of the San Joaquin Valley, Calif., the beet leafhopper moves down onto green summer annuals or onto crops in the valley, where it remains during the summer. The curly top virus disease of such crops, of which this leafhopper serves as the only known vector, causes damage every year to sugar beets, tomatoes, beans, melons, squash, and other truck crops and to ornamental plants, severe crop losses having occurred in years of high population of the pest. In the fall, at the time of harvesting beets and when the summer annuals dry, the beet leafhopper moves back to the range lands onto whatever host plants are green and feeds on these until the winter rains again bring on the growth of winter annuals.

It having been found by Piemeisel (E. S. R., 68, p. 42), working in Idaho, that the annuals serving as spring and summer hosts do not form a large part of the original vegetation in the southern area of that State, their great abundance being the result of overgrazing and abandonment of plowed lands, and that if abandonment ceased and grazing were restricted the host plants would be replaced by nonhost plants, chiefly grasses, and eventually by the original vegetation, an investigation was made of the extent and composition of the present vegetation and the original types in the San Joaquin Valley, where the situation is quite similar. It is pointed out that the zonal arrangement, etc., of plant types, mostly at a higher altitude than in the San Joaquin Valley, has been reported upon by Jepson (E. S. R., 57, p. 116).

In the work conducted by the authors the types of the original vegetation were reconstructed from the studies made and their probable boundaries mapped, as was also the present vegetation. Each of the principal original types shown on accompanying maps is briefly described. The derivation of present stands from the original, through modification or destruction, is also discussed, as well as the relation of the present stands of each particular type to the beet leafhopper. In order to show these interrelationships for the valley as a whole, a diagrammatic representation is presented. The more important relationships are discussed.

It is concluded that in California the beet leafhopper utilizes two sets of breeding host plants. "One set, the summer host plants, chiefly Russian-thistle, bract scale, and fogweed, is found to the greatest extent on intermittently farmed lands, while the other set, the winter host plants, such as plaintain, peppergrass, and some species of minor importance, is found where grazing is heaviest and the plant cover is thin or the soil nearly bare. A contemplated reduction of hosts need operate on only one of these sets, although it is extremely probable that if the acreage of both were reduced the reduction of either need not be so complete.

"The correction of the two uneconomical practices, intermittent farming and destructive grazing, is in accordance with the general principles of land conservation. Such a correction would also result in greatly reducing leafhopper populations and the curly top damage to crops."

Method of penetration, formation of stylet sheaths, and source of food supply of aphids, H. D. TATE (*Iowa State Col. Jour. Sci., 11 (1937), No. 2, pp. 185–206, pls. 8*).—The results of studies by the Iowa Experiment Station of the course of the setal path and the particular region of the plant sought as a source of food supply by aphids on 19 species are reported. Fifteen species of aphids were involved in the studies.

"Based on the course followed by the setae in penetration three types of setal paths were observed, namely, (1) intercellularly to the vascular bundle, (2) either inter- or intracellularly to the vascular bundle, and (3) a direct path to the vascular bundle regardless of cells or intercellular spaces. In all aphids studied the vascular bundle and particularly the phloem elements were found to be the objective of the setae and hence the principal source of food supply.

"A study of sections of onion tissues infested with *Aphis rumicis* and *Myzus persicae*, neither of which normally feeds on this plant, showed the method of penetration by the setae and source of food supply to be similar to that on normal host plants.

"With the technic employed, the extent to which stylet sheaths could be demonstrated was found to vary considerably among different species of aphids and in different species of plants. The plants which showed such symptoms

as leaf curling, rolling, or pseudo-leaf galls as a result of aphid attacks were found to exhibit marked histological abnormalities, principally in the form of pseudovascular tissue."

Codling moth biology and control investigations, C. R. Cutright (*Ohio Sta. Bul. 583 (1937), pp. 45, figs. 19*).—Studies of the biology of and control work with the codling moth, commenced in 1926 and extending over a period of 10 yr., are summarized.

The destructive activities of the pest were found to be greatly influenced by weather conditions, temperatures below the mean during late May and throughout June greatly aiding in its control during the season. "When temperatures are above normal during May and June a serious outbreak is to be anticipated, because eggs hatch in a shorter time and larvae leave the apples earlier, thus permitting a larger proportion to transform to moths in the midsummer broods. The increased hazard from codling moth due to warm seasons may be offset by extra sprays applied after the calyx. Such sprays are designed to build up residues and poison early larvae. Bands applied before the first larvae leave the fruit are of value because they also decrease the number of midsummer-brood moths and larvae.

"Moth emergence under natural conditions in the orchard extends over a longer period and is characterized by lower peaks than the emergence from cages. For commercial control in severely infested sections the tree must receive an adequate amount of spray. The minimum amount per application is usually considered to be ¾ gal. for each year of the tree's age. Spray must be so applied to the tree that all surfaces of fruit and foliage are covered. From the standpoint of cost and efficiency, lead arsenate is still the best orchard insecticide. It should never be omitted in the calyx spray. However, the use of lead arsenate after the second cover spray will almost surely produce excess spray residues. Nonlead arsenicals (calcium, zinc, and others) are less effective than lead arsenate, and their use in all-season schedules is not recommended. However, in orchards where insects are well controlled they may be used in late-season sprays at 1.5 times the usual strength of lead arsenate, provided excess lime is added. In their present forms they are not as safe as lead arsenate. Natural cryolite (the best of the fluorine sprays), when used with summer oil, is fairly effective against codling moth but its use after the second cover spray also gives excess residues. Nicotine in its various forms, if applied frequently, is effective against codling moth but not against apple maggot. It is more expensive than lead arsenate. Phenothiazine has shown promise as a control for codling moth in the Pacific Northwest, but experiments in Ohio and elsewhere in the East show that in its present form it is not suited to eastern conditions. The use of recognized sanitary practices is to be considered when a spray schedule of more than five cover sprays is necessary to control codling moth. Satisfactory control under conditions of heavy infestation is more nearly assured if, in addition to spraying, all supplementary sanitary practices are employed rather than only one or two."

Variations in the effectiveness of chemically treated codling moth bands, G. A. Filinger (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 191–194*).—This contribution from the Kansas Experiment Station includes data for the years 1933 and 1934 noted on page 73, together with the results of work conducted in 1935, the details being presented in tables. It is concluded that "chemically treated codling moth bands are less effective in killing larvae during seasons of high temperatures than during normal seasons. Bands carrying a heavy load of β-naphthol are more effective than those with low β-naphthol content. Where heavy loads are used, tree trunks can be protected with asphalt emulsion, water

glass, or linseed oil. Four-in. bands, unless very carefully dipped, are less effective than 2-in. bands. The addition of aluminum stearate to β-naphthol and oil makes the chemicals sticky. Bands in which the chemicals retain a gummy, sticky consistency are more effective than those in which the β-naphthol becomes dry and crystalline."

Investigation of codling moth populations as they affect control experiments, T. R. Hansberry (*Iowa State Col. Jour. Sci., 11 (1936), No. 1, pp. 63–65*).—The observations reported led to the conclusion that for the conditions studied "a thoroughly efficient experimental analysis may be based on 300 apple samples selected at random from each tree and evaluated for percentage of wormy fruit alone. The scoring of the dropped fruit and worms per 100 apples may be omitted without materially affecting differences due to treatment."

The tomato pinworm, J. C. Elmore (*U. S. Dept. Agr. Circ. 440 (1937), pp. 8, figs. 4*).—This practical summary of information on the tomato pinworm, based upon observations in California, New Mexico, and Florida, where it has been primarily a pest of field-grown tomatoes, and in Mississippi and States farther north, where it has been present only as a pest of tomatoes and other host plants grown in greenhouses and in nearby fields, is presented with references to the work of Thomas previously noted (E. S. R., 77, p. 78).

The pest has been recorded from Hawaii, Haiti, Mexico, and Peru, and larvae have been intercepted in tomatoes from the Bahamas, Bermuda, and Cuba.

The diamond back moth (Plutella maculipennis Curt.) as a pest of cruciferous plants in Finland, V. Kanervo (*[Finland] Valtion Maatalouskoet. Julkaisu. (Agr. Expt. Activ. State Pub.), No. 86 (1936), pp. 86, figs. 34; Eng. abs., pp. 81–86*).—An extended report of studies of the morphology, biology, and control of the diamondback moth, one of the most injurious insect enemies of crucifers in Finland. It is accompanied by a list of 128 references to the literature.

Effects of various blood fractions on egg production of Aëdes aegypti Linn., P. A. Woke (*Amer. Jour. Hyg., 25 (1937), No. 2, pp. 372–380*).—The results of the experiments reported indicate that the production of viable eggs in the yellow fever mosquito may follow the ingestion of drawn whole blood, defibrinated, decalcified, and heparinized blood. It may follow the ingestion of any one of the principal blood fractions, including erythrocytes, plasma, serum, and hemoglobin.

New Jersey Mosquito Extermination Association, twenty-third annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 23 (1936), pp. 210+[3], pls. 4, figs. 2*).—The contributions presented at the twenty-third annual meeting of the association, held at Atlantic City in March 1936 (E. S. R., 74, p. 71), include the following: Malaria in New Jersey, by W. H. MacDonald (pp. 8–14); A Summary of Mosquito Control Accomplishments in 1935, by T. D. Mulhern (pp. 14–51) (N. J. Experiment Stations); The Interest of the New Jersey Clubwomen in Anti-mosquito Work, by Mrs. A. R. Driscoll (pp. 51, 52); The Effect of the Depression Upon Mosquito Control and How It May Be Overcome, by J. G. Lipman (pp. 53–56) (N. J. Stations); A Resume of Work on Mosquitoes Throughout the World in 1935, by F. C. Bishopp and C. N. Smith (pp. 57–86); Mosquito Suppression Work in Canada in 1935, by A. Gibson (pp. 86–98); Progress of the Mosquito Control Campaign in the Des Plaines Valley Area [Ill.], by J. L. Clarke (pp. 98–111); Mosquito Control in Delaware, by W. S. Cockran (pp. 112–127); Accomplishments in Mosquito Control in Suffolk County, Long Island, by A. C. Froeb (pp. 128, 129); The CCC in Mosquito Work in Southern New Jersey, by F. A. Reiley (pp. 129–134), and in North Jersey, by J. P. Peterson (pp. 134–140); The Problem of Mosquito Control in

the Upper Passaic Valley [N. J.], I, by J. E. Brooks (pp. 140–143), and II, by R. L. Vannote (pp. 143–151); *Progress of Mosquito Control in Connecticut, 1935*, by R. C. Botsford (pp. 151–153) (Conn. [New Haven] Station); Some Early Pioneering in Connecticut Mosquito Control, by H. J. Case (pp. 154, 155); Information Needed for a Proper Understanding of the Effects of Mosquito Control Work on the Wildlife of Tidal Marshes, by I. N. Gabrielson (pp. 156–163); Additional Information Needed Concerning the Biology of Mosquitoes, by L. L. Williams, Jr. (pp. 163–166); Protection of Outdoor Gatherings From the Mosquito Pest, by J. M. Ginsburg (pp. 166–173) (N. J. Stations) (E. S. R., 74, p. 522); Mosquito Control in New York City, by J. L. Rice (pp. 174–179); Something to Think About in Connection with Mosquito Prevalence, by J. A. LePrince (pp. 191–193); Mosquito Control in Nassau County [Long Island], by E. Butchard (pp. 194–196); Salt-Marsh Vegetation and Its Relation to Mosquito Control, by L. A. DeVido pp. 196–203); and Mosquito Control Facts Taught by the Passing Years, by T. J. Headlee (pp. 204–209) (N. J. Stations).

The Clear Lake gnat, W. B. HERMS (*California Sta. Bul. 607 (1937), pp. 22, figs. 10*).—The present knowledge of the life history, habits, and means of control of the chaoborid gnat described by S. B. Freeborn in 1926 as *Chaoborus* (*Sayomyia*) *lacustris*,[1] based upon observations conducted along the shores of Clear Lake in Lake County, particularly in the vicinity of Lakeport, where this nonbloodsucking mosquito-like insect appears regularly in swarms every summer from early May to mid-October and is a source of great annoyance because of its abundance and strong attraction to light, is reported upon.

The eggs are deposited and the larvae develop in the lake in great numbers at a depth of from 15 to 20 ft., not being found in shallow water and never within 200 ft. from shore. The larval food consists of minute plant life, such as algae, and small aquatic animals, such as crustaceans, and in captivity they will readily eat each other. The control of this gnat in the egg stage does not appear to be feasible because they are deposited upon the water singly, and quickly sink to the bottom. Since the larvae do not come to the surface to breathe, the use of oil or a similar larvicide applied to the surface is ineffective. Because of the tremendous attraction that light has for the gnats, which upon emergence fly to shore, where mating takes place, trap lights appear to offer an unusual opportunity for their destruction before oviposition takes place.

A description and a diagram are given of a combined light and suction-fan trap, the use of which has given encouraging results. While, in the light of present knowledge, the task of completely ridding the lake of its gnat population appears to present almost insurmountable difficulties and might even be undesirable, it is concluded that a large degree of protection against this pest may be achieved by placing partly concealed insect light traps at strategical points about individual homes or summer resorts.

Fruit-fly in citrus: Results with sodium fluosilicate bait, L. B. RIPLEY and G. A. HEPBURN (*Union So. Africa Dept. Agr., Sci. Bul. 143 (1935), pp. 8*).—Observations in the Union of South Africa are said to indicate that the Mediterranean fruitfly in citrus can be economically controlled by spraying with a new formula consisting of sodium fluosilicate 0.25 oz., white sugar 0.5 lb., and water 1 gal., using from 4 to 12 oz. per tree, according to size. Trapping throughout the winter is considered to be essential as a guide to the spray program. "The Cedara glass traps, 1 to every 50 trees, baited weekly with clensel diluted 1:30 are advised. The spray should be applied during invasions or whenever the traps show an appreciable rise in the fruitfly population. There is a possibility of con-

[1] Pan-Pacific Ent., 2 (1926), No. 4, pp. 161–163.

trolling the fruitfly by eliminating the source of the winter invasions, this source being at present unknown."

Fruit fly (Ceratitis capitata): Baiting, trapping, and luring experiments, L. J. Newman and C. F. Jenkins (*Jour. Dept. Agr. West. Austral., 2. ser., 13 (1936), No. 3, pp. 345–349, figs. 2; also in Trop. Agr. [Ceylon], 88 (1937), No. 1, pp. 43–47, figs. 2*).—The results of a series of baiting, trapping, and luring experiments conducted during the summer and autumn of 1936 for the Mediterranean fruitfly are reported.

Observations on the biology of the wheat-stem maggot in Kansas, M. W. Allen and R. H. Painter (*Jour. Agr. Res.* [*U. S.*], *55 (1937), No. 3, pp. 215–238, figs. 5*).—Studies of the life history of the wheat-stem maggot, which is widely distributed through the wheat-growing area of North America, not uncommonly injuring from 10 to 15 percent and in some instances almost 100 percent of the plants, conducted by the Kansas Experiment Station in the vicinity of Manhattan since the fall of 1932, are here reported upon.

The life cycle, which includes three larval instars, is completed in from 18 to 82 days in the summer. "The winter is passed in the larval stage. At Manhattan, Kans., there are three generations and a partial fourth each year.

"During the course of these experiments four parasites, *Coelinidea ferruginea* Gahan, *C. meromyzae* (Forbes), *Microbracon meromyzae* (Gahan), and *Hypodiranchis* sp., were reared from puparia of the wheat-stem maggot. Eighteen species of Hymenoptera, including these four, were reared from volunteer wheat or culms heavily infested by the wheat-stem maggot. Nine species known to be parasitic on *Meromyza* are recorded in the literature.

"In the fall and early spring the wheat-stem maggot kills the central leaf of the plant, destroying the tiller on which it feeds. The white or blasted heads which appear at heading time result from the feeding of the larva above the upper node. The wheat-stem maggot has been recorded as feeding on several species of *Triticum*, on barley [and] rye, and on a number of native and introduced grasses. Plants from later sown seeds were more heavily infested in the spring than plants from earlier sowings. Differences in resistance to infestation were noted among the different wheat varieties tested. These differences may not be of economic importance, but further study should be made under more frequent and heavier infestations.

"The data collected from the variety and date-of-planting plats indicate that there is a stage in the growth of the plant which is more palatable to the larva or more attractive to the female fly than are other stages of growth."

A list of 30 references to the literature cited is included.

Studies in population physiology.—V, The oxygen consumption of the flour beetle (Tribolium confusum Duval), T. Park (*Jour. Cell. and Compar. Physiol., 7 (1936), No. 3, pp. 313–323*).—In this further contribution (E. S. R., 73, p. 216) an analysis of the weight and oxygen consumption of the confused flour beetle, raised in fresh and conditioned flour and kept distinct as to sex, is reported upon.

Studies in population physiology.—VI, The effect of differentially conditioned flour upon the fecundity and fertility of Tribolium confusum Duval, T. Park (*Jour. Expt. Zool., 73 (1936), No. 3, pp. 393–404, figs. 2*).—In continuation of the studies above noted, which have shown that the fecundity of the confused flour beetle is much lower in heavily conditioned flour than it is in fresh (unconditioned) flour, experiments are reported which have emphasized the relation of fecundity and fertility in flour in intermediate stages of conditioning.

"The data showed that a flour medium composed of 25 percent conditioned flour was sufficiently altered to lower oviposition significantly below the level of

a fresh flour control. No appreciable difference in fecundity could be detected between an environment composed of 25 percent conditioned flour and one composed of 50 percent conditioned flour. *Tribolium* living in a medium of 75 percent conditioned flour, however, produced significantly fewer eggs than did the beetles in the fresh and more lightly conditioned environments. Beetles living in the all or most heavily conditioned flour had the lowest rate of egg production. No distinct effects of conditioning on fertility could be demonstrated.

"These data suggest that self-conditioning of the environment by the beetles is a factor which contributes to the decline of their populations considerably before the culture has reached a decadent state."

Studies in population physiology.—VII, The relation of environmental conditioning to the decline of Tribolium confusum populations, T. Park and N. Woollcott (*Physiol. Zool., 10 (1937), No. 2, pp. 197–211, figs. 3*).—A continuation of the studies above noted, in which the various known physiological effects of conditioned flour on *T. confusum* are summarized.

Research on populations of Tribolium confusum and its bearing on ecological theory: A summary, J. Ford (*Jour. Anim. Ecol., 6 (1937), No. 1, pp. 1–14, fig. 1*).—This summary is presented with a list of 26 references to the literature.

The biology of Platygaster herrickii, a parasite of the hessian fly, C. C. Hill and W. T. Emery (*Jour. Agr. Res. [U. S.], 55 (1937), No. 3, pp. 199–213, figs. 11*).—A study of the serphoid hymenopteran *P. herrickii*, an important parasite of the hessian fly in certain sections of the United States, commenced by the senior author in the eastern coastal States in 1920 and including recent work on its occurrence and habits in the West Central States by the junior author, is reported. It occurs as a monembryonic parasite of the hessian fly throughout most of the winter-wheat-growing sections of the United States, being of importance in the more southern parts of the eastern wheat-growing sections, in parts of the central wheat belt west of the Mississippi River, and in western Oregon.

The primary larva is of the cyclopean type, and the mature larva, somewhat similar to those of other species of *Platygaster*, is segmented and reniform. The egg is deposited in the egg of the host during the spring oviposition period of the hessian fly. Embryological and larval development proceeds with the growth of the host until the end of the summer, when the cocoon is formed within the host puparium and pupation begun. The adult stage is reached before winter, but emergence is delayed until the following spring. In the Southeast heavy mortality occurs in the course of the season, due chiefly to competition with other species of parasites.

A list is given of 12 references to the literature cited.

The ecology of the harvest mite Trombicula autumnalis in the British Isles, G. Keay (*Jour. Anim. Ecol., 6 (1937), No. 1, pp. 23–35, fig. 1*).—This report on the distribution of *T. autumnalis* in the British Isles, its summer and winter hosts, rearing of the nymph, and the geographical distribution of Trombiculae parasitic on man is presented with a list of 26 references to the literature.

This mite is said to occur widely in the British Isles, the larvae having been found in summer on dog, rabbit, cat, horse, sheep, wood mouse, vole, hedgehog, shrew, stoat, gray squirrel, hare, partridge, pheasant, fowl, turkey, and sparrow. They tend to occupy a specific habitat on each animal. The larvae have been found overwintering in rabbits' ears in Berkshire and Somersetshire and in the ears of the bank vole (*Clethrionomys*) in Bagley Wood, near Oxford.

The ticks of Oregon, W. J. Chamberlin (*Oregon Sta. Bul. 349 (1937), pp. 34, figs. 11*).—Following a general account of ticks, their economic importance,

role as disease transmitters, etc., an annotated list is given of the species known to occur in Oregon, accompanied by outline maps showing their known distribution in the State. A brief account is then given of such species, followed by a list of the known hosts of the ticks of the State, a list of the literature referred to, a bibliography of the more important early writings on the spotted-fever tick, and recent articles on tick fever.

The endogenous phases of the life cycles of Eimeria nieschulzi, Eimeria separata, and Eimeria miyairii, coccidian parasites of the rat, R. L. Roudabush (*Iowa State Col. Jour. Sci., 11 (1937), No. 2, pp. 135–163, pls. 5, figs. 3*).—A study of the life cycle of three coccidian parasites of the rat is reported.

Observations on the development of the poultry gapeworm Syngamus trachea, E. E. Wehr (*Amer. Micros. Soc. Trans., 56 (1937), No. 1, pp. 72–78, figs. 16*).—The embryo of *S. trachea* was found to molt twice in the egg and to hatch as a third-stage larva which is infective for chicks or earthworms, developing to an adult in the chick and persisting as an infective third-stage larva in the earthworm. The first molt takes place on the fifth day and the second molt on the seventh day in cultures incubated at a temperature ranging from 24° to 30° C. The larva of *S. trachea* as it occurs in the earthworm does not differ, morphologically, from the larva which has passed through two molts in the egg. The occurrence of third-stage larvae in the liver of a chick, although noted in only one case, is indicative of migration through the blood stream. The male and female worms attach in permanent copula as young adults, attachment taking place in the lungs.

The cysticercoid of Choanotaenia infundibulum (Bloch) and the house fly as its host, W. M. Reid and J. E. Ackert (*Amer. Micros. Soc. Trans., 56 (1937), No. 1, pp. 99–104, figs. 5*).—In this contribution from the Kansas Experiment Station the cysticercoids of the chicken tapeworm *C. infundibulum* removed from the body cavities of houseflies are described and compared with those studied by other authors. It appears that the housefly is a very important intermediate host of this tapeworm and may possibly serve also as an intermediate host for *Raillietina cesticillus* (Molin).

ANIMAL PRODUCTION

Mineral nutrition of farm animals, H. H. Mitchell and F. J. McClure (*Bul. Natl. Res. Council, No. 99 (1937), pp. 135*).—This extensive report discusses the problem of mineral nutrition of farm animals under the following headings: The mineral supply in farm feeds, evidences of mineral malnutrition in animals, availability and utilization of minerals, the mineral requirements of farm animals, and practical considerations. An extensive bibliography and tabulations of the organic and mineral analyses of feeds, and the estimated calcium and phosphorus requirements of poultry, swine, beef cattle, dairy cattle, and sheep are appended.

[Investigations with livestock in Arizona] (*Arizona Sta. Rpt. 1936, pp. 39–46, 81–84, fig. 1*).—Results are reported on the nutritional qualities of a grass-type range in southern Arizona, the seasonal changes in the chemical composition of some important range grasses, and the relation of type and conformation to the economy of gain and killing qualities of range steers.

Poultry investigations yielded information on the effect of backcrossing and reciprocal crosses on egg production in the offspring, the utilization of locally produced grains in the poultry ration, and the effect of certain environmental factors on the natural egg cycle.

[Investigations with livestock in Kansas] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 60–65, 78–85, 125, 126, 128*).—Beef cattle studies reported include the palatability of tankage in the wintering ration, immature corn silage v. cottonseed hulls for wintering 2-year-old heifers, the value of molasses as an appetizer with cottonseed hulls and with wheat straw, and a comparison of ground barley v. shelled corn with and without silage for fattening steers, all by A. D. Weber and W. E. Connell; utilizing native grass in beef cattle feeding, by C. W. McCampbell, Weber, and Connell; factors which influence the quality and palatability of meat, by D. L. Mackintosh, J. L. Hall, M. S. Pittman, and G. Vail; and the utilization of western Kansas feeds for the maintenance of beef cattle at the Fort Hays Substation, by L. C. Aicher and McCampbell.

Swine studies gave information on the phosphorus requirements of swine, by C. E. Aubel and J. S. Hughes; and the value of alfalfa pasture and various protein concentrates in the swine fattening ration, by Aubel and Connell.

Sheep investigations include emergency rations for wintering yearling ewes, and a comparison of various protein concentrates in lamb fattening rations, both by R. F. Cox and Connell; and the value of milo and other native feeds in lamb rations at the Garden City Substation, by F. A. Wagner and Cox.

From poultry studies results are presented on certain phases of turkey production, by H. M. Scott and Hughes; guinea production, relation of hatching date to income from eggs, effect of storage on deterioration of eggs, and acid-treated silage for poultry, all by L. F. Payne; factors influencing the color of yolks of eggs, by Payne and Hughes; and the physiology, mechanism, and chemistry of egg formation, by D. C. Warren, Scott, and Hughes.

[Investigations with livestock in New Hampshire] (*New Hampshire Sta. Bul. 296 (1937), pp. 8, 15, 16, 19, 29, 30*).—Results are briefly noted on the nutrition of the horse and pig, by E. G. Ritzman and F. G. Benedict; and sheep breeding investigations, by Ritzman. Poultry studies reported include the relation of bacteria to ruptured egg yolks, by L. W. Slanetz and C. L. Martin; the protein and vitamin A requirements of chickens at various stages of growth and development, by A. E. Tepper, R. C. Durgin, and T. B. Charles; and equipment for the wax plucking of poultry, by W. T. Ackerman and G. M. Foulkrod.

Growth and development with special reference to domestic animals, XLI, XLII (*Missouri Sta. Res. Buls. 262 (1937), pp. 24, figs. 8; 263 (1937), pp. 40, figs. 9*).—This series of studies is continued (E. S. R., 76, p. 370).

XLI. *Relation between live weight and chest girth in dairy cattle of unknown age*, S. Brody, H. P. Davis, and A. C. Ragsdale.—Based on a total of 15,610 individual weight and chest girth measurements of dairy cattle in the Missouri and Nebraska station herds, representing four dairy breeds and a wide range of ages, the relationship between weight and chest girth has been determined.

While certain factors such as breed and level of nutrition influenced this relationship, it is shown that within certain limits weight is a power function of chest girth expressed by the equation $Y = aX^n$, in which Y is body weight and X chest girth. The value of the exponent n is of the order of 2.82, ranging from 2.72 to 2.88 for the various groups studied. This relationship is considered to be sufficiently constant to permit the practical estimation of weight from chest girth measurements. Tables and charts are presented for making such estimates for cattle of mixed ages.

XLII. *Methane, hydrogen, and carbon dioxide production in the digestive tract of ruminants in relation to the respiratory exchange*, L. E. Washburn and S. Brody.—This bulletin describes a method and apparatus employed in securing from cattle directly expired air for analysis. Employing this method, accurate time curves were charted for carbon dioxide and methane excretion and oxygen

consumption at various intervals after feeding. Also, simultaneously, time curves were secured on the composition of the rumen gas, samples being obtained through a permanent rumen cannula. Information is also presented on the composition of gas in various parts of the digestive tract of slaughtered animals. Assuming that carbon dioxide and methane diffuse out of the rumen at equal rates, the total carbon dioxide expired was corrected for fermentation carbon dioxide, and on this basis true respiratory quotients were computed and contrasted with the apparent respiratory quotients formerly published. It was apparent that the carbon dioxide-methane ratio was not constant but declined in a typical manner after feeding, as did actual fermentation losses. The feed energy losses by fermentation were estimated to be about 25 percent of the maintenance requirement of the animal when fed at a maintenance level. The data obtained also furnished a basis for correcting for methane accumulation in spirometers or respiration chambers during metabolism tests.

A study of Utah's winter range: Composition of forage plants and use of supplements, A. C. ESPLIN, J. E. GREAVES, and L. A. STODDART (*Utah Sta. Bul. 277 (1937), pp. 48, figs. 25*).—This is primarily a description of 16 dominant forage plants collected on the winter range, with analyses and other information on their composition (organic and mineral) and estimated nutritive value. These plants were blue sage, Brigham tea, brown sage, bud sage, curly grass, curly sage, fourwing saltbush, matchweed, rabbitbrush, rice grass, Russian thistle, salt sage, shadscale, white cedar, white sage, and yellowbrush. A fairly satisfactory nutritive ratio and a relatively high nutritive value for these plants is indicated, with phosphorus appearing as the only element likely to be deficient. Preliminary results gave inconclusive evidence as to the value of corn and cottonseed cake as concentrate supplements for wintering sheep on desert range.

Cacao husks as a feeding stuff [trans. title], G. PFEIFFER and L. CLARENZ (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 1-2, pp. 148-158; Eng. abs., pp. 156-158*).—Cacao husks obtained from industrial sources were found to contain on the average from 15 to 18 percent of crude protein and one variety having an especial aromatic odor contained 26 percent. Its digestibility as determined analytically was found to be about 40 percent (55 percent in the case of the aromatic husk). The pure protein was somewhat more digestible than the crude protein. Feeding trials with wethers, in which cacao husks were fed as the main source of protein, gave results in close agreement with the digestible protein values as obtained in analytical trials. On the basis of these trials a starch value of 42 kg is assigned, which closely corresponds to that of coarse wheat bran.

The starch value of carrots [trans. title], G. FINGERLING (*Landw. Vers. Sta., 127 (1936), No. 3-4, pp. 157-223*).—A comparison of unpublished data obtained by Kellner and coworkers in respiration experiments with oxen and by the author in similar trials with pigs indicated that, with both species of animals, carrots had a high digestibility. Nitrogen-free extract and crude fiber were similarly digested by both species. Crude protein was more efficiently digested by pigs, and the fat fraction was better digested by oxen. Starch values per 100 kg of dry matter in carrots were found to be 61 and 56.8 kg for oxen and pigs, respectively. However, pigs appeared to utilize the digestible constituents of carrots to about a 25-percent greater extent than oxen.

Rough rice for fattening cattle, sheep, and hogs, L. A. WEAVER and H. C. MOFFETT (*Missouri Sta. Bul. 386 (1937), pp. 15, figs. 2*).—Feeding tests were conducted with fattening steers, lambs, and hogs in which rough rice replaced all the corn in the ration, and also with lambs and hogs in which rice replaced one-half of the corn. The rice used proved palatable in all cases, being fed

whole to the lambs, ground to the cattle, and either ground or cooked to the hogs. With each type of animal, replacing corn with rice resulted in a slower rate of gain and a greater consumption of both grain and supplement per unit of gain. The slower gain, however, could be overcome by lengthening the feeding period. Nearly twice as much protein concentrate was required to balance the ration when rice replaced corn. The grades of beef, lamb, or pork produced on the rice rations were considered satisfactory. The rice was approximately 70 percent as valuable pound for pound as corn when completely replacing it in the ration but had a considerably greater relative value when used as a partial substitute for corn.

The influence of lignins on the digestibility of rye straw [trans. title], N. D. PRJANISCHNIKOW and M. F. TOMME (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 1–2, pp. 104–112; Eng. abs., p. 112*).—Digestion trials with rabbits gave evidence that treating straw with chlorine dioxide materially increased the digestibility of the nitrogen-free extract and crude fiber content of the straw. In untreated straw only from 13 to 15 percent of the crude fiber and 23 percent of the pentosans were digested, whereas in treated straws 79 percent of the crude fiber and 81 percent of the pentosans were digested. Analysis of the straw showed only small losses of carbohydrates, pentosans, or crude fiber due to the chlorine dioxide treatment but almost complete destruction of the lignins, leading to the conclusion that the removal of the lignins is the cause of the increased digestibility of other normal constituents of the straw.

The vitamin B content of wood sugar yeast [trans. title], A. SCHEUNERT and M. SCHIEBLICH (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 1–2, pp. 113–119, figs. 2; Eng. abs., p. 119*).—Based on rat feeding trials 1 g of dried lignose yeast (*Torula utilis*) was found to contain 6 international units of vitamin B_1 and from 10 to 18 biological units of B_2. This level of B_1 could have been supplied from the culture medium, but the high content of B_2 indicated that synthesis of this factor had occurred.

Further studies on the vitamin B content of wood sugar yeast, with reference to the question of vitamin synthesis by yeasts [trans. title], A. SCHEUNERT and M. SCHIEBLICH (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 2, pp. 173–177, fig. 1; Eng. abs., p. 177*).—Cultures of yeast (*Torula utilis*) were grown on inorganic medium except for the use of "wood sugar" molasses as a source of carbohydrates. Rat tests indicated that the dried wood sugar yeast contained 8 international units of vitamin B_1 and about 10 units of B_2. These results were interpreted as indicating that *T. utilis* was capable of synthesizing vitamin B_1 as well as vitamin B_2 (considered as the sum of all other B factors necessary for the rat).

Commercial feeding stuffs—report on inspection, 1936, E. M. BAILEY (*Connecticut* [*New Haven*] *Sta. Bul. 397 (1937), pp. 417–509+XVII–XX*).—This is the usual report of the analyses and guaranties of 1,831 samples of feeding stuffs collected for official examination during the calendar year 1936 (E. S. R., 75, p. 821). Included are 52 samples of dog feeds.

Analyses of commercial feeding stuffs and registrations for 1937, C. S. CATHCART (*New Jersey Stas. Bul. 629 (1937), pp. 67*).—This is the usual report of the analyses and guaranties of 2,127 samples of commercial feeding stuffs collected for official inspection during 1936 (E. S. R., 75, p. 821).

Influence of type and age in fattening cattle, G. A. BRANAMAN and G. A. BROWN (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 14–17*).—This is a report of the second trial of this study (E. S. R., 76, p. 228). Lots of 10 Holstein calves averaging 494 lb. and 10 Hereford calves averaging 405 lb. were compared for feeding efficiency and economic returns over a 189-day feeding

period, a ration of shelled corn, cottonseed meal, corn silage, and alfalfa hay being fed. The Holstein calves made slightly greater average daily gains but required about 15 percent more feed per unit of gain than the Hereford calves. The Herefords showed higher average slaughter and carcass grades, and the sale values of the fat cattle were $11.50 and $9.38, respectively, for the Herefords and Holsteins. Making allowance for feed costs, interest on steers, and pork credits on the basis of 1936–37 prices, the value of feeder cattle was $11.49 and $7.11 for Herefords and Holsteins, respectively.

Fattening beef calves on milo grain prepared in different ways, J. M. JONES, W. H. BLACK, F. E. KEATING, and J. H. JONES (*Texas Sta. Bul. 547* (*1937*), *pp. 32, figs. 8*).—These experiments were conducted cooperatively with the U. S. D. A. Bureaus of Animal Industry and Plant Industry during the 1931–32, 1932–33, and 1933–34 feeding seasons, comparing the feeding value of unground threshed milo, ground threshed milo, unground milo heads, and ground milo heads for fattening beef calves of weaning age, 15 steers per lot being employed in each instance. The trials extended over an average feeding period of 187 days. Sorgo fodder and cottonseed meal were fed with the milo in the various forms.

Steers receiving the ground grain consistently made greater gains, attained a higher as well as a more uniform finish, and sold at a higher price on the market than those fed unground milo. However, when hogs followed the steers the unground grain was converted into more pounds of gain (beef and pork) than was the ground grain. With the beef and pork prices prevailing during these trials the net returns were consistently lower for the groups receiving unground grain. Unground threshed milo produced larger gains than the unground milo heads, but the average results did not show sufficient difference to warrant the expense of threshing the grain for cattle feeding in the milo-producing area. Ground threshed milo produced somewhat greater gains but at a higher feed cost per pound of gain than ground milo heads, with the former showing a somewhat lower net return. Hog gains per steer in the groups fed unground grain were approximately four times as great as those made by hogs following steers fed ground grain. If hog prices per 100 lb. live weight had been relatively the same as those prevailing for fat steers, the advantage in favor of grinding would not have been so great.

Mineral supplements for cattle on phosphorus-deficient range, J. H. KNOX and P. E. NEALE (*New Mexico Sta. Bul. 249* (*1937*), *pp. 16, figs. 6*).—In an experiment extending from March 15, 1933, to November 11, 1936, three similar groups of grade Hereford heifers, grazed on range shown to be deficient in phosphorus but fairly high in calcium, had free access to mineral mixtures consisting of 60 percent of bonemeal and 40 percent of salt, 40 percent of monocalcium phosphate and 60 percent of salt, and 40 percent of dicalcium phosphate and 60 percent of salt, respectively.

As indicated by the total gains in weight over the entire period, these three mineral mixtures were equally effective in supplementing such range forage. The animals consumed approximately the same amount of salt regardless of the amount of mineral it contained, and because of this fact the average daily phosphorus intake from the mineral mixture per animal was 0.278, 0.174, and 0.184 oz. on the bonemeal, monocalcium phosphate, and dicalcium phosphate supplements, respectively. Apparently the lower level of phosphate intake was adequate to supplement such range, and the higher levels of calcium intake failed to stimulate more rapid gain. It is concluded that a ranchman "should use the best information available to estimate the mineral composition of his forage

and feed the amount and kind of mineral best suited to bring its mineral content up to the desired level."

Sheep production in Kansas, H. E. REED (*Kansas Sta. Bul. 275 (1937), pp. 72, figs. 40*).—This publication supersedes Bulletin 240 (E. S. R., 58, p. 463).

Varied amounts of corn and alfalfa for feeder lambs, L. H. BLAKESLEE and G. A. BROWN (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 18–20*).—Two feeding trials with lambs are reported, in each of which three groups of lambs were fed shelled corn and first-cutting alfalfa hay in the approximate proportions of 1 : 1, 1 : 2, and 1 : 3, respectively. Actual proportions of corn to hay consumed were 1 : 1, 1 : 1.36, and 1 : 2.25, respectively. The lambs fed at the ratios of 1 : 1 and 1 : 2 made equal gains, but on the basis of feed consumed per unit of gain, the 1 : 2 ratio produced the most economical gains unless corn is worth less than 15 times per ton that of hay. The group fed at the ratio of 1 : 3 made slightly slower gains and at a higher cost per unit of gain unless corn is worth more than 4.2 times per ton as much as alfalfa hay. Only slight differences were noted in dressing percentages and carcass grades for the three groups.

Comparison of ground hegari fodder and alfalfa hay in lamb fattening rations, P. E. NEALE (*New Mexico Sta. Bul. 250 (1937), pp. 15*).—These experiments were formulated in an effort to determine what amount, if any, of alfalfa hay is necessary in lamb fattening rations in which hegari fodder is fed as a roughage. Three series of experiments were reported, in each of which 10 groups of 20 lambs each were used. In all trials the concentrate intake was constantly maintained, the only variable being the amounts of hegari fodder and alfalfa allowed. In the second and third series, one-half of the groups received white corn and the other half yellow corn, the rations of the paired groups being identical in other respects.

There were no apparent differences in the rate or economy of gains between the lots receiving yellow corn and those receiving white corn. Alfalfa hay alone proved superior to hegari fodder alone as a roughage, but when fed together a proportion of equal parts of these roughages was considered most satisfactory. The rations containing hegari as the only roughage were very low in calcium, while the addition of 1 lb. of alfalfa per lamb daily supplied approximately an optimum amount of this element.

Self- versus hand-feeding for market hogs, with particular reference to effects on carcass measurements and quality, E. W. CRAMPTON (*Sci. Agr., 17 (1937), No. 9, pp. 529–539; Fr. abs., p. 539*).—In this experiment at Macdonald College two groups of 20 weanling purebred Yorkshire pigs were penned and fed individually, the same ration being hand-fed to one group and self-fed to the other. The average length of the feeding period to market was 114.5 and 121.6 days; the average daily gains per head were 1.5 and 1.37 lb.; and the gains per 100 lb. of feed consumed were 26.3 and 24.9 lb. for the hand-fed and self-fed groups, respectively. The results of grading on the hoof showed 10 "selects" and 10 "bacons" in the hand-fed lot and 7 selects and 13 bacons in the self-fed lot. A number of individual carcass measurements were made, and each carcass was scored by a scoring system as described. No important differences due to self-feeding were noted in carcass studies of the two groups of hogs grading select, and the only item showing a significant difference in the bacon grades was that the self-fed pigs averaged 1.47 in. shorter in carcass length than the hand-fed group. A comparison of carcass scores with live grades indicated that too much stress should not be laid on differences between selects and bacons in live grading.

Value and use of oats in the rations of growing-fattening swine, W. E. CARROLL, W. P. GARRIGUS, G. E. HUNT, and R. A. SMITH (*Illinois Sta. Bul. 436 (1937), pp. 113–170*).—A total of 17 different feeding trials, conducted over a

period of years and involving 1,290 pigs in all, are reported. Various phases of the study dealt with the comparative value of oats and corn in swine rations, the optimum proportion of oats in the ration, the value of grinding and hulling oats for swine, and certain nutritive deficiencies encountered.

It is concluded that (1) oats may be added to the growing-fattening ration of swine to the extent of nearly one-half the ration without appreciably affecting the growth rate of pigs, but that adding oats in any proportion tends to increase the total amount of feed required per unit of gain made; (2) unless oats are as cheap per pound as corn, or cheaper, they cannot be used profitably in the pig fattening ration; (3) grinding oats increased their value for pigs and very materially increased their feed replacement value in the growing-fattening ration; (4) grinding or hulling oats markedly improved their palatability for pigs; (5) hulled oats kernels were superior to ground oats or to corn in feeding value, but because of the cost and inefficiency of the process hulling proved to be a less profitable method of preparation than grinding; and (6) a ration of hulled oats supplemented with 5 percent of alfalfa meal, 2 percent of tankage, and 0.5 percent of salt fed in dry lot induced a condition of stiffness and unthriftiness in pigs which often resulted in death. This condition was prevented by adding 1.5 percent of bonemeal or a combination of bonemeal and cod-liver oil but was not prevented by cod-liver oil without bonemeal.

Observations on the water vaporization of working horses [trans. title], H. TOEPSCH (*Landw. Vers. Sta., 127 (1936), No. 3–4, pp. 225–234, fig. 1*).—This study indicated that the relative humidity of the atmosphere was the principal controlling factor, the rate of vaporization decreasing as the humidity increased. The extent to which respiration and skin losses are each concerned was not established, but probably at a relative humidity of 100 percent vaporization does not occur through perspiration but only by respiration. The rate of work is the second though less significant controlling factor, and air temperature is of third importance. It is noted that humidity also exerted a marked influence on the daily variations in body weight and on the rate of water intake.

The determination of the effect of fattening on the carcass of the chicken, W. A. MAW and I. E. PUDDINGTON (*Sci. Agr., 17 (1937), No. 9, pp. 540–543, fig. 1; Fr. abs., p. 543*).—This report from Macdonald College describes a method of sampling poultry carcasses for chemical analysis in which perimuscular fat, i. e., the intermuscular fat intimately connected with the fascia and the layer of fascial fat on the external surface of the muscles, is considered a logical part of the sample of breast or thigh muscles for the determination of the fat content of such groups of muscles. A comparison of the fat content of breast and thigh muscles including the perimuscular fat and with the muscle fat only indicated a significant difference due to the two methods of sampling, particularly in the case of breast muscle where inclusion of perimuscular fat more than doubled the average fat content.

Relation of grit to the development of the gizzard lining in chicks, H. R. BIRD, J. J. OLESON, C. A. ELVEHJEM, E. B. HART, and J. G. HALPIN (*Poultry Sci., 16 (1937), No. 4, pp. 238–242, fig. 1*).—In a series of chick feeding trials at the Wisconsin Experiment Station involving a ration known to produce crater lesions in the gizzard (E. S. R., 77, p. 88) and one known to contain an ample supply of the antigizzard-erosion factor, it was found that an abnormal thickening or swelling of the gizzard lining which was distinctly different from crater lesions occurred in the young chicks fed a finely ground gritless ration. The addition of 5 percent of medium-sized granite grit to the ration or feeding a coarsely ground ration largely prevented this condition and resulted in more rapid growth. There was evidence that in chicks suffering from crater lesions

due to deficiency of the antigizzard-erosion factor the presence of grit in the diet may aggravate this condition, and such gizzards may show thickening of the lining as well as lesions. The relationship of these results to the findings of certain other investigators is discussed.

A method for determining the digestibility of crude fiber with poultry [trans. title], N. I. CHLEBNIKOW (*Biedermanns Zentbl., Abt. B, Tierernähr.*, 8 (1936), No. 1-2, pp. 32-41; Eng. abs., pp. 40, 41).—The results of these experiments indicate that because of the slow movement of crude fiber through the digestive tract of birds a satisfactory trial for determining accurate coefficients of digestibility for crude fiber should consist of three periods, namely, a preliminary period of 20 days on a fiber-free diet, a 10-day main period on the experimental ration, and a 20-day after period on a fiber-free diet to insure total excretion of crude fiber ingested during the main experimental period.

Green feed and pasture for poultry, H. A. SCHOTH (*Oregon Sta. Circ. 123* (1937), pp. 16, figs. 5).—Prepared in cooperation with the U. S. D. A. Bureau of Plant Industry, this circular briefly discusses methods of producing green feed and pasture, the crops best adapted for poultry feeding during the various seasons, and means of most economically utilizing such crops and their substitutes.

The value of leaf meals of alfalfa, Korean lespedeza, and Lespedeza sericea in all-mash chick rations, G. D. BUCKNER, W. M. INSKO, JR., J. H. MARTIN, and A. HARMS (*Kentucky Sta. Circ. 48* (1937), pp. 25-31).—This describes a series of chick feeding trials in which leaf meals of these three legumes, each separately and in combination, were used to replace certain ingredients in an all-mash ration. The results indicated that the three leaf meals were of approximately equal value, and that these meals, with a suitable quantity of starch, could replace mixed wheat feed on the basis of equal quantities of protein in the chick growing ration. Retarded growth resulted when the leaf meals replaced both wheat feed and either dried skim milk or meat scrap on the basis of equal quantities of protein. Better growth resulted when the leaf meals replaced meat scrap than when they replaced dried skim milk in the basal ration.

Protein supplements for laying hens, M. W. MILLER and G. E. BEARSE (*Washington Sta. Bul. 347* (1937), pp. 16, fig. 1).—In this experiment, conducted at the Western Washington Station, 8 groups of 60 Single Comb White Leghorn pullets were used in trials starting November 1, 1934, and continuing 308 days. A basal ration consisting of mill run, wheat middlings, ground yellow corn, ground oats, ground barley, ground white wheat, and dehydrated alfalfa 18:10:20:15:15:15:7 was used throughout the trial. Protein supplements consisted of Alaska herring fish meal; fish meal and soybean meal; fish meal and skim milk powder; fish meal and meat scrap; fish meal, skim milk powder, and meat scrap; skim milk powder and meat scrap; soybean meal and meat scrap; and soybean meal and skim milk powder for lots 1 to 8, respectively. The proportions of protein supplement, bonemeal, and oystershell flour were so adjusted that each ration contained 16 percent protein, 2.35 percent calcium, and 0.85 percent phosphorus, with 0.5 percent salt and 0.25 percent cod-liver oil added to each ration. Results are reported in terms of live weight changes, total egg production, percentage egg yield, feed cost per dozen eggs, percentage mortality, quality of fresh eggs, quality of spring and summer eggs after shipment to New York and after 11-15 weeks' and 5-8 months' storage in New York, and the influence of the ration on egg hatchability.

It is concluded that total egg production, egg weight, albumin quality, yolk color, yolk shadow, and commercial candling grades were not markedly affected by the various combinations of protein supplements used. Mortality in the various groups ranged from 10 to 28.7 percent, but no relationship between type of ration and percentage mortality could be established. Egg hatchability and albumin color were definitely higher in all combinations of protein supplements containing the dried skim milk. However, the presence of the dried skim milk in the mixture increased the feed cost per dozen eggs. The quality of the fresh eggs was an accurate index of their quality after shipment to New York, both at the time of arrival and after storage. In all lots of eggs yolk color and yolk shadow darkened during storage.

Chondrodystrophy in the chick embryo produced by manganese deficiency in the diet of the hen, M. Lyons and W. M. Insko, Jr. (*Kentucky Sta. Bul. 371 (1937), pp. 61–75, figs. 2*).—In the experiments reported laying hens were fed a ration which produced a high percentage of slipped tendons in chicks, with and without a supplement of manganese, zinc, and iron, and the effects on embryonic development and hatchability were noted. After 75 days on the unsupplemented ration the eggs produced gave very low hatchability, with a peak of embryonic mortality on the twentieth and twenty-first days of incubation. Embryos that died after 10 days of incubation were chondrodystrophic, characterized by short thickened legs, short wings, "parrot beak", globular contour of head, protruding abdomen, and retarded down and body growth, with approximately 75 percent of such cases showing marked edema. Hens receiving this ration plus the supplement produced eggs giving good hatchability of normal chicks, and dead embryos showed normal skeletal development. When hens which had been on the deficient ration were transferred to farm conditions and allowed green range, sunlight, and a ration containing considerable manganese, they produced eggs supporting normal embryonic development within 15 days. Eggs producing chondrodystrophic embryos were much lower in manganese content than eggs producing normal embryos, and a group of the abnormal embryos that died on the nineteenth, twentieth, and twenty-first days of incubation contained an average of 2.4 μg of manganese as compared with an average of 7 μg in normal embryos. Chondrodystrophy was completely prevented by the injection of 0.03 mg of manganese directly into the egg albumin before incubation, but similar injections of zinc were ineffective. The probable identity of this abnormality with that reported by other investigators (E. S. R., 76, p. 889) is discussed.

The effect of various calcium and phosphorus salts on the severity of perosis, H. S. Wilgus, Jr., L. C. Norris, and G. F. Heuser (*Poultry Sci., 16 (1937), No. 4, pp. 232–237*).—This study at the [New York] Cornell Experiment Station included three separate experiments, involving in all 24 lots of chicks each subjected to a 6-week experimental feeding period. The basal diet containing 0.5 percent of iodized salt as the only mineral supplement was fed throughout. A formula for determining the percentage severity of perosis in the various lots is presented. When steamed bonemeal and ground limestone were added to the basal diet at such levels as to maintain a constant calcium-phosphorus ratio of 1.5:1, 1.5 percent of calcium and 1 percent of phosphorus in the diet caused as much perosis as when higher levels were fed, the degree of incidence ranging from 97 to 100 percent in all cases. When the phosphorus intake was maintained constant at 1.2 percent and the calcium intake varied to give calcium-phosphorus ratios of 1.5, 2, and 2.5 to 1, 100 percent incidence of perosis occurred in each case, although the highest ratio

produced slightly less severe deformities. The third phase of the study dealt with the effectiveness of different sources of phosphorus in producing perosis. The feeding of chemically pure calcium carbonate, hydroxide, and chloride, and chemically pure mono-, di-, and tricalcium phosphates increased the severity of perosis to about the same extent as steamed bonemeal, and chemically pure monosodium phosphate was somewhat more effective in removing this deformity. In one instance where a technical grade of monocalcium phosphate exerted a perosis-preventive action the results were attributed to the presence of some contaminating material and not to the form of the salt.

Individual hen and breed difference in egg weight losses during incubation, A. B. GODFREY and M. W. OLSEN (*Poultry Sci., 16 (1937), No. 4, pp. 216–218*).—In this study by the U. S. D. A. Bureau of Animal Industry, eggs from White Leghorn and Rhode Island Red pullets were weighed 1 day after being laid, were incubated for 14 days at a temperature of 99.5° F. and a relative humidity of 60 percent, and were then reweighed and candled. In the final analysis only birds that had 5 or more infertile eggs, 5 or more eggs containing live embryos, or both, were included. The mean percentage loss in weight from eggs containing live embryos and for infertile eggs was 8.82 and 8.42, respectively, for White Leghorns and 9.4 and 9.52, respectively, for Rhode Island Reds. Eggs from the same bird were much less variable in weight loss than eggs from different birds, indicating that weight loss of eggs is a characteristic depending to a large degree on the individuality of the hen.

Further studies of the effects of selenium poisoning on hatchability, W. E. POLEY, A. L. MOXON, and K. W. FRANKE (*Poultry Sci., 16 (1937), No. 4, pp. 219–225, figs. 5*).—Continuing this line of investigation (E. S. R., 76, p. 245), an experimental ration was prepared in which 25 parts of toxic ground corn (29 p. p. m. selenium), 25 parts of toxic ground barley (15 p. p. m. selenium), and 15 parts of toxic ground wheat (30 p. p. m. selenium) replaced equal quantities of normal grain in the control ration. Three pens of White Leghorn pullets were fed the control ration over a period of 6 weeks to establish their normal egg production, fertility, and hatchability. Pen 1 was continued as a control group, pen 2 was fed the toxic ration, and pen 3 the toxic ration to which 1 percent of powdered sulfur had been added over an experimental period of 5 weeks. All lots were then fed the control ration for an additional period of 6 weeks.

It was found that laying hens consumed less feed and lost weight during the toxic grain feeding period and egg size decreased correspondingly. Egg production and fertility were not appreciably affected, but hatchability decreased to zero, no normal chicks being hatched after the seventh day of toxic feeding while by the sixth day after restoring the normal ration the toxic effect on embryonic development and hatchability had disappeared. Monstrosities characteristic of selenium poisoning occurred on the toxic ration, but none were produced on the control ration. One percent of elemental sulfur in the ration failed to affect the action of selenium.

Summary of feeding and confinement rearing experiments with turkeys during 1936 (second report), F. N. BARRETT, C. G. CARD, and A. BERRIDGE (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 3–11, figs. 3*).—This is the second report of this study (E. S. R., 76, p. 235). Poults used in the 1936 trials represented two hatchings, the first on May 20 and the second on June 4. Five experimental pens of 30 poults each were made up from each hatching. Pens from each group received 22, 23, and 26 percent of protein mash, respectively, throughout the 24-week trial, while the remaining two pens received the 23- and 26-percent mashes, respectively, to 7 weeks of age when both were changed to a 22-percent mash for the remaining weeks of the trial. All pens had only water

to drink and had free access to chopped alfalfa after the third week and to corn and grit after the seventh week of the trial. Poults receiving the higher protein mashes consumed a greater proportion of grain as they approached maturity than those on the lower protein mashes. In each trial poults receiving the 26-percent protein mash throughout were the best appearing birds of the lot. They made slightly better average gains, but the poults on the 22- and 23-percent mashes, while lacking the sleek appearance of the 26-percent protein group, made somewhat cheaper gains. The 22-percent protein mash containing no dried skim milk proved undesirable as a starting ration. An average total mortality of 12.4 percent was experienced, with most losses occurring during the first 10 weeks. An unusual beak disorder of undetermined origin which was prevalent in all pens at about the same time, when the respective groups were 9 and 11 weeks of age, is described.

The influence of some factors on the storage quality of eggs, R. M. SMITH (*Arkansas Sta. Bul. 341 (1937), pp. 33, fig. 1*).—Studies, dealing with the effects of various factors on the storage quality of eggs, are reported. Forty-six separate lots totaling 10,333 eggs were stored at from 30° to 31° F. and at a relative humidity of 82 percent for periods ranging from 214 to 334 days.

Green feed had no material influence on the storage quality of eggs when fed as a supplement to a standard egg-producing ration, but when fed as a supplement to an unbalanced ration it markedly reduced the storage quality. Eggs produced on an unbalanced ration alone were inferior in keeping quality to those produced on the basal ration. Cottonseed meal fed at the rate of 2.5 percent of the total ration had no detrimental effect, but at a 6.5 percent level it resulted in the production of eggs unfit for storage. Feeding rice byproducts had no deleterious effect in this respect. The time of holding eggs before storage had little or no influence on the loss in grade during storage, although largely influencing the loss in grade during holding, and a high negative relationship was found to exist between the loss in grade during holding and the loss during storage. Eggs held at temperatures below 70° lost less in grade during holding and also less during the storage period. Washed eggs lost more in quality and also in weight during storage than unwashed eggs, and fertile eggs lost quality more rapidly than infertile eggs. Shell texture was not significantly correlated with loss in quality either during holding or storage or with loss in weight during storage. The cooking quality of storage eggs was adversely affected by feeding large amounts of cottonseed meal and by feeding an unbalanced ration either with or without green feed.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the 31st annual meeting of the American Dairy Science Association] (*Jour. Dairy Sci., 20 (1937), No. 7, pp. 395, 397–475, 501, 502, fig. 1*).—Following are listed the titles and authors of papers pertaining either to dairy production or dairy manufacturing, presented at the annual meeting of the association (E. S. R., 76, p. 525) held at Lincoln, Nebr., June 1937: The Preparation, Properties, and Use of Gonad-Stimulating Hormones, by L. E. Casida (p. 395); Artificial Insemination—Demonstration, by H. P. Davis and G. W. Trimberger (pp. 397, 398); A Study of the Methods of Sampling Milk for Butterfat Tests Where a Combine Milker Is Used, by K. S. Morrow and H. C. Moore (pp. 399–401); Changes Occurring in Freshening Dates From Year to Year of Cows in Iowa Testing Associations, by C. Y. Cannon and D. L. Espe (pp. 401, 402); A New Visible System of Dairy Herd Books, by F. W. Atkeson and H. W. Cave (p. 402); Estimating Live Weight From Chest Girth of Dairy Cattle of Unknown Age, by S. Brody, H. P. Davis, and

A. C. Ragsdale (pp. 403–405); Is the Calcium: Phosphorus Ratio of Common Mineral Mixtures Suited to Dairy Cattle? by G. Bohstedt (pp. 405, 406); The Essentiality of Cobalt in Bovine Nutrition, by W. M. Neal and C. F. Ahmann (pp. 406, 407); Fermentation Energy Losses in Dairy Cattle, by L. E. Washburn (p. 407); Acetonemia and Ketonuria in Dairy Cows Under Farm Conditions, by C. W. Duncan, C. F. Huffman, and H. A. Tobin (p. 408); Certain Points in the Physiological Processes of the Cow, by R. B. Becker (pp. 408–410); The Adrenal Cortical Hormone in Relation to Lactation, by E. T. Gomez and C. W. Turner (pp. 410, 411); The Role of the Nervous System in the Hormonal Control of Lactation, by R. P. Reece and C. W. Turner (pp. 411, 412); The Effects of Thyroxine on Milk and Fat Production, by H. A. Herman, W. R. Graham, and C. W. Turner (pp. 412, 413); On the Carbohydrate and Nitrogen Metabolism of the Mammary Gland, by W. R. Graham (p. 413); The Value of Corn Sugar in the Grain Mixture of Dairy Calves, by C. A. Ward, C. Y. Cannon, and D. L. Espe (pp. 413, 414); Replacing Whole Milk in the Calf Ration, by R. T. Parkhurst (p. 414); Hay Consumption of Holstein Calves, by H. S. Willard (pp. 414, 415); Development of Calves on Prairie Hay When Fed Milk From Dams on Similar Rations, by H. W. Cave, W. H. Riddell, and J. S. Hughes (pp. 415, 416); Limited Prairie Hay Rations and Avitaminosis in Dairy Heifers, by A. H. Kuhlman, A. Nalbandov, and E. Weaver (pp. 417, 418); Limited Grain Feeding of Dairy Cattle, by C. E. Wylie and L. R. Neel (pp. 418, 419); Some Experiences in Feeding Cattle on Rations Devoid of Roughage, by T. W. Gullickson (pp. 419, 420); A Comparison of Pasture Returns From Actual Grazing and Clip Plot Methods, by I. R. Jones, H. P. Ewalt, and J. R. Haag (pp. 420, 421); The Losses of Dry Matter in Corn Silage Stored in Snow-fence Silos and the Cost Per Ton of Storage, by J. B. Shepherd (pp. 421–423); The Apparent Digestibility and Feeding Value of Apple-Alfalfa Silage, by J. C. Knott and R. E. Hodgson (p. 423); Mungbean Silage for Milk Production, by A. H. Kuhlman, A. Nalbandov, and E. Weaver (pp. 423, 424); Molasses Grass Silage as the Sole Roughage Diet for Milk Production and Growth of Dairy Animals, by C. B. Bender, J. W. Bartlett, H. H. Tucker, and J. P. Mixner (pp. 424–426); Relation of Grass Silage to the Color, Vitamin C, and Flavor in Milk From Individual Cows, by O. F. Garrett, C. B. Bender, and H. H. Tucker (pp. 426, 427); Technique Used in Studying Vitamin A Requirements of Dairy Cattle, by L. A. Moore (p. 427); The Carotene and Color Content of Home-grown Roughage Feeds and the Relation of These Rations to the Carotene, Color, and Vitamin A Activity of the Butterfat, by R. E. Hodgson, J. C. Knott, H. K. Murer, and R. R. Graves (pp. 427, 428); Effect of Carotene Intake on the Carotene and Vitamin A Content of Butter, by H. J. Smith and E. B. Powell (p. 428), An Attempt to Remove the Vitamin A Suppressing Factor in Soybean Oil by Adsorbents, by S. M. Hauge, J. W. Wilbur, and J. H. Hilton (p. 429); The Relation of A. I. V. Alfalfa Silage and Carotene Content of Milk, by W. E. Petersen, J. B. Fitch, and N. N. Allen (pp. 429, 430); Effect of Molasses and A. I. V. Silages on the Carotene and Vitamin A Content and the Growth-Promoting Quality of Milk, by D. M. Hegsted and G. Bohstedt (pp. 430, 431); Oxidised Milk Flavor as Related to Carotene, Lecithin, and Vitamin C, by C. H. Whitnah, W. H. Martin, and G. H. Beck (pp. 431, 432); The Vitamin D Requirement (U. S. P. Units) for Growth and Well-Being of Calves From Birth to Six Months of Age, by S. I. Bechdel, N. W. Hilston, and N. B. Guerrant (pp. 432, 433); Studies on Methods of Concentrating the Vitamin D of Butterfat for Assay Purposes, by G. C. Wallis (p. 433); X-ray Technique for Studying Rickets in Calves, by S. I. Bechdel and N. W. Hilston (p. 434); Effects of a Vitamin D Deficiency on Mature Dairy Cows, by G. C. Wallis (pp. 434, 435); Irradiation

of Milk—The Interrelation of Radiation Intensity and Milw Film Capacity, by H. H. Beck, H. C. Jackson, and K. G. Weckel (p. 435); Hair Pigment, by W. E. Petersen and W. M. Sandstrom (pp. 435, 436); The Relation of the Endocrine Glands to the Inheritance of Milk Secretion, by C. W. Turner (pp. 436, 437); Evaluation of Different Measures of Inherited Producing Ability in Dairy Cattle, by G. E. Dickerson (pp. 437–440); Are Culls Really Culls, by D. M. Seath (p. 440); Differences Between Records, Real Productivity, and Breeding Values of Dairy Cows, by J. L. Lush and F. J. Arnold (pp. 440, 441); The Isolation of the Citric Acid Fermenting Streptococci From Butter Cultures, by H. C. Olson (p. 442); The Correlation Between the Organisms Found Microscopically in Butter Serum and the Grade of Cream From Which the Butter Was Made, by T. Hedrick (p. 442); The Detection of Mastitis by the Brom-thymol-blue Test, Leucocyte Count, and the Microscopic Examination of Milk, by A. C. Fay, H. W. Cave, and F. W. Atkeson (pp. 442, 443); A Combined Pasteurizer, Cooler, and Incubator for Mother Starter, by G. H. Wilster and F. E. Price (pp. 443, 444); Studies Upon a Bacteriophage Inhibitory to *Streptococcus lactis*, by F. E. Nelson and B. W. Hammer (p. 444); The Dye Concentration in Culture Media Employed for the Analyses of *Escherichia-Aerobacter* Members in Milk, by H. D. McAuliffe and A. A. Borland (pp. 444, 445); The Effect of Salts on the Growth of Bacteria in Milk, by C. S. Mudge and F. G. Anderson (p. 445); Comparative Studies on Bacterial Milk Counts in Various Types of Media Incubated at 20°, 30°, and 37° C., by J. D. Dennis and H. H. Weiser (pp. 445, 446); A Study of Comparative Methods and Media Used in the Microbiological Examination of Creamery Butter.—I, Yeast and Mold Counts, by G. W. Shadwick, Jr. (p. 446); Proposed Standard for the Yeast and Mold Count of Salted Butter Made From Sour Cream, by E. H. Parfitt (p. 447); Studies on *Oospora lactis*, by H. Macy and D. L. Gibson (pp. 447, 448); *Pseudomonas fragi* and Its Importance in Dairy Products, by H. F. Long and B. W. Hammer (p. 448); The Manufacture of Sweetened Condensed Whey and Its Use in Foods, by G. A. Ramsdell and B. H. Webb (pp. 448, 449); The Manufacture of Non-Foaming Casein, by G. A. Richardson, N. P. Tarassuk, and L. B. Fry (p. 449); Flexible Milk Plants, by W. E. Guest and R. W. Balderston (pp. 449, 450); Sonic Homogenization of Milk and Ice Cream Mixes, by L. A. Chambers (pp. 450, 451); A Suggested Method of Evaluating Homogenization Efficiency by Improved Photomicrography, by A. W. Farrall and R. L. Hanson (pp. 451, 452); A Simplified Solids Tester for Ice Cream, by K. M. Renner (p. 452); The Effect of Certain Salts on Properties of Ice Cream Mixes, by J. I. Keith, C. W. Rink, and E. Weaver (p. 452); Power Requirements for Freezing Ice Cream, by W. J. Caulfield, C. K. Otis, and W. H. Martin (p. 453); Sogo Ice Cream, by T. B. Harrison and C. E. Wylie (pp. 453, 454); Flavor Defects Encountered in Strawberry Ice Cream Prepared With Commercial Skim Milk and Condensed Milk From Stainless Steel Pans, by E. W. Bird, J. J. Willingham, and C. A. Iverson (pp. 454, 455); Some Factors Affecting the Serving and Dipping Qualities of Ice Creams, by W. H. E. Reid and W. S. Arbuckle (p. 456); Volumetric Method for the Determination of Diacetyl, by H. A. Ruehe and W. J. Corbett (pp. 456, 457); The Influence of Heated Testers and Composite Tests on the Babcock Test, by P. S. Lucas (pp. 457, 458); Removal of French Weed Flavor From Cream, by W. B. Combs and S. T. Coulter (p. 458); Effect of Temperature on the Rate of Deterioration of Cream, by W. H. Martin, A. C. Fay, and W. J. Caulfield (pp. 458, 459); Some Aspects of the Reduction of Acidity in Cream for the Manufacture of Butter, by E. W. Bird, N. E. Fabricius, and D. F. Breazeale (pp. 459, 460); Studies in the Keeping Quality of Butter Made From Sour Cream,

by J. C. Flake and E. H. Parfitt (pp. 460, 461); Notes on Problems Confronting the Industry on Quality Improvement of Creamery Butter, by M. E. Parker (pp. 461, 462); Overcoming the Gummy Body of Butter Caused by Feeding Cottonseed Meal, by J. I. Keith, C. W. Rink, and A. H. Kuhlman (pp. 462, 463); The Lactic Acid Content in Butter, Progress Report, by B. E. Horrall and W. F. Epple (p. 463); pH Range of Centralizer Butter, by W. H. Brown and E. H. Parfitt (pp. 463, 464); Microflora of Cheese Slime, by H. Macy and J. A. Erekson (p. 464); Making Cheddar Cheese From Low Curd Tension Milk, by J. C. Marquardt and G. J. Hucker (pp. 464, 465); Curd Tension Measurements, by L. H. Burgwald and T. V. Armstrong (pp. 465, 466); The Effect of Varying Storage Temperatures and the Effect of Coverings on the Ripening of Cheddar Cheese, by W. G. McCubbin and E. L. Reichart (pp. 466, 467); Cheese Freezing and Curding Investigations, by J. C. Marquardt (pp. 467, 468); Studies Relative to an Open Flame Method for Determining the Moisture Content of Cheddar Cheese, by I. A. Gould (p. 468); The Homogenization of Milk for Blue Cheese, by C. B. Lane and B. W. Hammer (pp. 468, 469); Studies on the Ripening of Blue or American Roquefort Cheese, by S. T. Coulter, W. B. Combs, and J. S. George (p. 469); Studies on the Ripening of Blue Cheese, by C. B. Lane and B. W. Hammer (pp. 469, 470); The Influence of Steapsin on the Rate of Ripening Blue or American Roquefort Cheese, by W. B. Combs and S. T. Coulter (p. 470); A Photomicrographic Study of Processed Cheese, by H. L. Templeton (pp. 470, 471); Influence of Manufacturing Methods Upon the Acidity of Brick Cheese, by D. W. Spicer and W. V. Price (p. 471); Relation Between Acid Defects and Hydrogen Ion Concentration in Brick Cheese, by W. V. Price and D. W. Spicer (pp. 471, 472); Bound Water and Its Relation to Dairy Products, by H. Pyenson and C. D. Dahle (pp. 472, 473); The Phosphatase Test for the Efficiency of Pasteurization, by A. B. Storrs and L. H. Burgwald (pp. 473, 474); The Significance of Ammonia in Milk—A Practical Method for Its Determination, by A. E. Perkins (pp. 474, 475); The Application of Ritter's Test for the Detection of Copper in Milk and Dairy Products, by J. Turgeon, V. C. Stebnitz, and H. H. Sommer (p. 475); and Rapid Calculation of Rations by Means of a Pony, by P. T. D. Arnold (pp. 501, 502).

[Investigations with dairy cattle and dairy products in Kansas] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 65–74, 75, 76, 129*).—Brief results are presented on milk as a sole diet for calves, the influence of the ration and certain other factors on the vitamin C content of milk, and deficiencies of prairie hay in the dairy ration, all by H. W. Cave, W. H. Riddell, J. S. Hughes, and C. H. Whitnah; silage weight determinations, the value of tankage for dairy cows, prairie hay v. alfalfa for dairy cows, the digestibility and feeding value of Russian-thistle hay, Sudan grass as a pasture crop, the preparation and palatability of molasses-corn fodder mixtures, and summer feeding and management practices, all by F. W. Atkeson, Cave, and Riddell; prairie hay for dairy calves, by Cave; and dairy herd improvement at the Colby Substation, by E. H. Coles.

With dairy products, results are reported on the relative merits of various milk proteins in ice cream, the keeping quality of sodium caseinate sol, and gelatin v. Darloid as an ice cream stabilizer, all by W. H. Martin and W. J. Caulfield; bacteriological studies of ice cream, and the microscopic enumeration of micro-organisms in butter, both by A. C. Fay; the effect of lactic cultures on the keeping quality of cream, by Martin; and the formation, isolation, and properties of milk sugars, by Whitnah and Caulfield.

[Investigations with dairy cattle and dairy products in New Hampshire] (*New Hampshire Sta. Bul. 296 (1937), pp. 8, 9, 14, 15, 23, 24*).—Results are briefly reported on the metabolism of lactating cows, by E. G. Ritzman and

F. G. Benedict; the adequacy of present standards for feeding lactating cows, by Ritzman, Benedict, and K. S. Morrow; the value of cod-liver oil in calf rations, by Morrow; the influence of pastures on the solids-not-fat content of milk, by H. C. Moore; and the hemolytic streptococci in pasteurized milk, by L. W. Slanetz.

List of sires proved in dairy herd improvement associations, 1935–37 (*U. S. Dept. Agr., Misc. Pub. 277 (1937), pp. 105*).—This is a list of 1,553 dairy sires proved for production in dairy herd-improvement association work in various States between November 1, 1935, and April 1, 1937, compiled by the Bureau of Dairy Industry. Information presented for each sire includes age, date proved, State in which proved, name and number of the sire and dam, the numbers and average production of all tested daughters, and the number and average production of daughters out of tested dams, along with the average production of the dams. At least five daughter-dam comparisons are necessary to qualify a bull for the proved sire list.

[Investigations with dairy products] (*Arizona Sta. Rpt. 1936, pp. 48, 49*).—Brief information is presented on the physiological varieties of bacteria in milk at the time of reduction in the methylene blue reduction test, and methods for canning milk on the farm.

The reliability of flavor judgments, with special reference to the oxidized flavor of milk, G. M. Trout and P. F. Sharp (*[New York] Cornell Sta. Mem. 204 (1937), pp. 60, figs. 18*).—Two separate studies are reported, the first dealing with the reliability of judgments on the tastes of pure solutions and the second on the reliability of judgments on the oxidized flavor of milk.

Based on many thousands of taste judgments on a large number of 10-sample series of sodium chloride, sucrose, lactose, lactic acid, and quinine sulfate solutions, it is concluded that 10 percent variations in concentration of any of these solutions can be readily detected, and that the judges were capable of discriminating changes as low as 1 percent in concentration of sodium chloride solutions ranging in concentration from 0.13 to 0.2 percent. The temperatures at which maximum discriminatory ability for the various solutions was found were 21° C. (69.8° F.) for sodium chloride, lactic acid, and quinine sulfate, and 35° for sucrose and lactose. Extensive information relating to various factors affecting taste judgment is presented.

In the judging of 2,152 milk samples for oxidized flavor it is shown that a group of samples rated as +++, ++, +, ?, and — were, respectively, identified on a retasting of the shuffled series with 78.06, 34.56, 22.84, 18.18, and 90.18 percent accuracy.

Standards for "strong to very strong", for "distinct to pronounced", and for "slight" oxidized flavor in milk are suggested. A temperature of 21° appeared to be more favorable than 35° for judging intensity of oxidized flavor. Factors involved in taste judgment for oxidized flavor are discussed.

Chemistry of butter and butter making.—III, The relationships between (1) the percentage fat and (2) the protein percentages of cream and the churning loss, E. W. Bird and H. A. Derby (*Iowa Sta. Res. Bul. 214 (1937), pp. 125–156, figs. 7*).—Continuing this series (E. S. R., 78, p. 295), studies were conducted to determine the relationship between the percentage of butterfat and the total protein, casein, and albumin content in cream and the percentage of total fat placed in the churn that is lost in the buttermilk. The various series of churnings were made up of lots of cream ranging from 20 to 40 percent in fat content and included sweet, ripened, and neutralized creams, produced both in winter and summer seasons, and churned both in large and small churns.

Buttermilk samples were tested by the Mojonnier, American Association, Minnesota, and Babcock methods, and data are presented to indicate the relation of buttermilk test and percentage of total fat lost when these various methods were employed.

On the basis of the Mojonnier test the fat content of buttermilk from 20 to 30 percent cream varied but little, while the variation with cream from 30 to 40 percent was relatively large. The reverse was true of the percentage of total fat placed in the churn that was lost in the buttermilk, this value varying widely between 20 and 30 percent cream, less with 30 to 35 percent cream, and but slightly with 35 to 40 percent cream, with minimum losses occurring in the vicinity of 37.5 percent. This indicates the necessity of considering the fat test of cream in calculating churning losses. It appears that from 1 to 1.2 percent of the total fat churned from 37.5 percent cream and 1.4 to 1.6 percent of the total fat from 30 percent cream are about the lowest churning losses likely to be attained. Equations are presented for calculating the percentage of total fat loss based on the cream and buttermilk tests, and a chart showing this relationship has been prepared which permits the rapid determination of such losses. It appears that casein may play an important part in the colloid-chemical relationships of the churning process, but that albumin is of slight importance in determining churning losses.

Standardization of Iowa butter, M. Mortensen, D. F. Breazeale, C. H. Meyer, and M. B. Michaelian (*Iowa Sta. Bul. 358 (1937), pp. 377–405, figs. 8*).—The objectives of this study were to determine variations in the composition of Iowa butter and the average minimum fat content that may safely be attained, to estimate the butter overrun that a well-operated creamery may be able to maintain, and to present to creamery operators the value and ways and means of systematic composition control. Cooperating creameries in the State submitted butter samples for analysis at regular intervals. The average composition of 1,344 samples of butter analyzed in 1933 was butterfat 80.71, moisture 16.17, salt 2.38, and curd 0.74 percent. One plant produced butter having an average fat content for 1 yr. of 80.48 percent, with every churning conforming to the Federal standard. Gains in butter yield among plants practicing systematic control are indicated. It is estimated that it will be difficult to obtain an overrun of 23 percent in a gathered cream plant and above 20 percent in a whole milk plant. The value of uniform methods of procedure in manufacturing is pointed out.

Methods of making Cheddar cheese from milk with a low curd tension due to latent mastitis, J. C. Marquardt and G. J. Hucker (*New York State Sta. Tech. Bul. 242 (1937), pp. 18, figs. 2*).—The recommendations set forth in this bulletin are based on the results obtained in the manufacture of five lots of Cheddar cheese from milks containing demonstrable numbers of mastitis streptococci, having a high leucocyte count, and lacking in normal curd-formation properties. By the addition of from 1.5 to 3 percent of starter or by the addition of 30 percent hydrochloric acid at the rate of 100 cc per 1,000 lb. of milk with smaller amounts of starter, such milk could be made into a satisfactory Cheddar cheese comparing favorably in yield and in texture and flavor score with cheeses made from normal milk. *Streptococcus agalactiae* were found to be present in rather large numbers in four of the five lots of experimental cheese after 9 mo. of curing. The authors stress the necessity and importance of using some test like the Marschall cup test in making cheese from such milks with curd tension varying from normal. Unless such milks are especially handled during the cheese-making process, excessive losses may be experienced.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 74, 107–115*).—The progress of investigations during the 2-yr. period 1935–36 briefly reported upon (E. S. R., 73, p. 98) includes mastitis control, by A. C. Fay; infectious enteritis of cats and miscellaneous animal diseases, by R. R. Dykstra and H. F. Lienhardt; Bang's disease, by Lienhardt and C. H. Kitselman; blackleg, by J. P. Scott; anaplasmosis, by H. Farley and Lienhardt; feeder cattle diseases, by Farley; several poultry diseases, by L. D. Bushnell and C. A. Brandly; and miscellaneous parasites and resistance of chickens to parasitism, both by J. E. Ackert.

[Work in animal pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 296 (1937), pp. 30–33*).—The work of the year considered (E. S. R., 75, p. 546) relates to a technic for the eradication of pullorum disease, by C. A. Bottorff; control of coccidiosis, by C. L. Martin, T. B. Charles, R. C. Durgin, and S. R. Shimer; epidemic tremors of chickens, by Bottorff, A. E. Tepper, Charles, and Durgin (E. S. R., 76, p. 854); vaccination for Bang's disease, by Martin; and control work with fowl pox and laryngotracheitis (distribution of vaccine).

[Contributions on animal pathology] (*N. Y. State Vet. Col. Rpt., 1935–36, pp. 59–171, pls. 9, figs. 3*).—Contributions presented in this further report (E. S. R., 77, p. 243) include the following: A Study of the Antigenic Properties of Certain Normal and Pathological Lymphoid Deposits in Tissues of Chickens, by C. Olson and A. Zeissig (pp. 59–68); The Treatment of Ascariasis in Chickens (pp. 69–75) (E. S. R., 76, p. 397), A New Method for Embryonating Nematode Eggs in Fecal Discharges (pp. 76, 77) (E. S. R., 76, p. 252), and The Effect of Atmospheres of Hydrogen, Carbon-Dioxide, and Oxygen, Respectively, and of Mixtures of These Gases on the Growth of *Bacillus subtilis* (pp. 151–157), all by P. P. Levine; Hemorrhagic Septicemia (pp. 78–82) (E. S. R., 77, p. 542) and Clinical Observations in Acetonemia of Cattle (pp. 100–113), both by M. G. Fincher; Hemorrhagic Septicemia (pp. 83, 84) (E. S. R., 77, p. 542) and Acute Diffuse Peritonitis (pp. 114–117), both by W. J. Gibbons; Physiological Aspects of Ketosis in Cows and Ewes With Special Reference to Carbohydrate Metabolism, by J. Sampson and C. E. Hayden (pp. 85–99) (E. S. R., 76, p. 250); Primary Brain Tumors in Small Animals, by H. J. Milks and P. Olafson (pp. 118–124); Some Notes and Data Concerning the Resistance Conferred by Calfhood Exposure to Bang's Disease, by R. R. Birch and H. L. Gilman (pp. 125–132); The Effect of a Virulent Strain of *Brucella abortus* on Guinea Pigs Previously Injected With Strain No. 19 of *Brucella abortus*, by W. S. Stone (pp. 133–150); A Study of Some Acid-Fast Actinomycetes From Soil With Special Reference to Pathogenicity for Animals, by R. E. Gordon and W. A. Hagan (pp. 158–164) (E. S. R., 77, p. 538); and A Survey of the Parasites of Sheep in New York State, by D. W. Baker (pp. 165–171).

The combating of animal diseases and the improvement of stock in Empire countries.—I, The combating of animal diseases, J. Smith (*Empire Jour. Expt. Agr., 5 (1937), No. 17, pp. 19–28*).—A general discussion of the subject as related to the British colonies and dependencies.

Report of the veterinary director general for the year ending March 31, 1936, G. Hilton et al. (*Canada Dept. Agr., Rpt. Vet. Dir. Gen., 1936, pp. 65*).—This report (E. S. R., 74, p. 539) presents accounts of the contagious diseases division, by A. E. Cameron (pp. 9–31); the meat and canned foods division, by R. Barnes (pp. 32–37); and the pathological division, by E. A. Watson (pp. 38–44). In the several appendixes The Agglutination Test for

B[rucella] abortus Infection as Applied at the Animal Diseases Research Institute, Hull, Que., is considered by E. A. Watson (pp. 45, 46); a Progress Report on the Investigation of Bovine Haematuria (Redwater) in British Columbia is made by J. C. Bankier (pp. 47–50), and Studies Relative to the Permanency of *Brucella abortus* Infection, by C. A. Mitchell and F. A. Humphreys (pp. 50–60), and the work of the Poultry Pathology Laboratory, by C. H. Weaver (pp. 60–63), are included.

Report on the veterinary service for the year ending March 1935, J. M. Smith et al. (*Palestine Dept. Agr. and Forests Ann. Rpt., 1935, pp. 47–102*).—This report (E. S. R., 73, p. 537) contains an account of the occurrence of and work conducted with infectious and parasitic diseases of livestock, including a report of the pathologist of the Government Veterinary Laboratory, J. S. Gilbert (pp. 64–68).

Annual report of the Veterinary Department, Straits Settlements, for the year 1934, S. H. Whitworth (*Straits Settlements Vet. Dept. Ann. Rpt., 1935, pp. 58*).—The occurrence of and work of the year with livestock diseases (pp. 27–38), particularly rinderpest, foot-and-mouth disease, and ovine coccidiosis, are included in this, the usual annual report (E. S. R., 75, p. 104).

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 7 (1936), Nos. 1, pp. 9–178, 275–366, pl. 1, figs. 107; 2, pp. 397–520, 533–609, pls. 2, figs. 45*).—The contributions here presented (E. S. R., 76, p. 848) are as follows:

No. 1.—Studies on the Neurotropic Virus of Horsesickness—V, The Antigenic Response of Horses to Simultaneous Trivalent Immunization, by R. A. Alexander (pp. 11–16) (E. S. R., 74, p. 254); Horsesickness: Immunization of Horses and Mules in the Field During the Season 1934–1935 With a Description of the Technique of Preparation of Polyvalent Mouse Neurotropic Vaccine, by R. A. Alexander, W. O. Neitz, and P. J. du Toit (pp. 17–30); Notes on Species of Trichodectidae With Descriptions of New Genera and Species (pp. 33–58), New Species of *Linognathus* and *Polyplax* (*Anoplura*) (pp. 59–65), Description of a New Species of *Hippobosca* [*martinaglia*] (Diptera: Pupipara) (pp. 67, 68), and A Synoptic Check-List and Host-List of the Ectoparasites Found on South African Mammalia, Aves, and Reptilia (Supplement No. 1) (pp. 69–110), all by G. A. H. Bedford; Pasteurellosis: An Outbreak Amongst Sheep, by M. W. Henning and M. H. V. Brown (pp. 113–131); The Isolation of Single Bacterial Cells, by J. H. Mason (pp. 133–141); The Production of Immunity to *Cl[ostridium] chauvoei*, by J. H. Mason and J. R. Scheuber (pp. 143–165); Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, by D. G. Steyn (pp. 169–178); A Contribution to the Study of the Pathology of Oesophagostomiasis in Sheep, by P. J. J. Fourie (pp. 277–347); and Studies on the Photosensitisation of Animals in South Africa—IX, The Bile Flow of the Merino Sheep under Various Conditions, by J. I. Quin (pp. 351–366).

No. 2.—Anthelmintic Tests, Chiefly With Tetrachlorethylene, for the Removal of the Hookworm *Gaigeria pachyscelis* From Infested Sheep, With Observations on the Effects of This Drug on Other Parasitic Nematodes, by R. J. Ortlepp and H. O. Mönnig (pp. 399–417); A New Fly Repellent [Tagetes Oil] and a Blowfly Dressing—Preliminary Report, by H. O. Mönnig (pp. 419–430); The Toxin of *Clostridium chauvoei*, by J. H. Mason (pp. 433–482); Chemical Studies Upon the Vermeerbos, *Geigeria aspera* Harv.—I, Isolation of a Bitter Principle "Geigerin", by C. Rimington and G. C. S. Roets (pp. 485–506), and II, Isolation of the Active Principle, "Vermeeric Acid", by C. Rimington, G. C. S. Roets, and D. G. Steyn (pp. 507–520); The Occurrence of Congenital Porphyrinuria (Pink Tooth) in Cattle in South Africa (Swaziland), by P. J. J.

Fourie (pp. 535–566); and Some Cases of Congenital Porphyrinuria in Cattle: Chemical Studies Upon the Living Animals and Post-Mortem Material, by C. Rimington (pp. 567–609).

Rural health practice, H. S. Mustard (*New York: Commonwealth Fund; London: Oxford Univ. Press, 1936, pp. XVIII+603, figs. 28*).—A discussion of the public health practice in rural areas, presented in 24 chapters.

Treatise on medical and veterinary helminthology, M. Neveu-Lemaire (*Traité d'helminthologie médicale et vétérinaire. Paris: Vigot Bros., 1936, pp. XXIII+1514, [pl. 1], figs. 787*).—Part 1 of this work deals with general helminthology (pp. 1–76) and part 2 with special helminthology (pp. 77–1360), including Trematoda (pp. 78–362), Cestoda (pp. 362–651), Nematoda (pp. 653–1329), and Acanthocephala (pp. 1330–1360). Part 3 consists of a list of the definitive hosts of helminths (pp. 1361–1401) and part 4 the intermediate hosts of helminths (pp. 1403–1472). A bibliography of five pages and an index are included.

***Helminth parasites* of the domesticated animals in India,** G. D. Bhalerao (*Imp. Council Agr. Res. [India], Sci. Monog. 6 (1935), pp. [3]+365+2, figs. 164*).—Following a brief introduction and discussion of technic, this work presents descriptions of the helminths of domestic animals in India, their hosts, location in the body, and geographical occurrence, together with keys to the families, genera, and species of trematodes, cestodes, and nematodes. A systematically arranged list of parasites with their location, an 11-page list of references to the literature, and a systematic index are included.

Worm parasitism in domestic animals, B. Schwartz (*Sci. Mo., 44 (1937), No. 4, pp. 338–349*).—Following some general considerations of helminth parasitism, parasites of swine, horses, and ruminants are dealt with practically.

Blood and tissue studies in experimental ascariasis, H. E. Biester and D. F. Eveleth (*Amer. Jour. Hyg., 25 (1937), No. 1, pp. 135–140*).—The pathology and changes of certain blood constituents in artificially produced ascariasis are described and a correlation is shown.

An antigenic polysaccharide fraction of Ascaris lumbricoides (from hog), D. H. Campbell (*Jour. Infect. Diseases, 59 (1936), No. 3, pp. 266–280*).—A description of and experiments with a polysaccharide from *A. lumbricoides* in the hog that has been isolated and purified are reported. "Experiments on precipitin, skin, and anaphylactic tests indicate that the polysaccharide is capable of inducing the formation of specific antibodies as well as reacting with them to give specific test reactions. The reactions are immunologically specific with respect to a similar polysaccharide from *M[oniezia] expansa* (sheep tapeworm). . . . The results obtained so far not only indicate the immunological significance of polysaccharides from animal parasites, but also suggest a source from which large quantities of polysaccharide can be obtained for immunochemical study."

Thelazia californiensis, a nematode eye worm of dog and man, with a review of the Thelazias of domestic animals, C. A. Kofoid, O. L. Williams, and N. C. Veale (*Calif. Univ. Pubs. Zool., 41 (1937), No. 17, pp. 225–233*).—This contribution is presented with a list of 30 references to the literature.

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—IV, *On the lethal effects of some nitrogenous fertilizers on the free-living stages of sclerostomes*, I. W. Parnell (*Canad. Jour. Res., 15 (1937), No. 7, Sect. D, pp. 127–145, figs. 11*).—This further contribution (E. S. R., 77, p. 245) deals ... mmon nitrogenous fertilizers on the free-livi[...] ... the most lethal. Under the conditions of th[...] ... ideal for the survival of the larvae, one part ... feces is necessary to sterilize

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them. The proportions of the others tested are: Calurea 1:80; powdered cyanamide 1:50, with granular cyanamide slightly lower; potassium nitrate, sodium nitrate, and Calnitro 1:20; calcium nitrate and diammonium phosphate (dry or in medium strength solution) 1:17; Nitro-chalk about 1:16 (but should not be used in strong solution); and ammonium sulfate 1:14.

A study of poisonous Drymaria on southern New Mexico ranges, E. L. Little, Jr. (*Ecology, 18 (1937), No. 3, pp. 416–426, figs. 4*).—Studies are reported of the characteristics and life cycle of poisonous *Drymaria* (*D. holosteoides* or *D. pachyphylla*), the most toxic for cattle of the harmful plants that grow on clay (adobe) soils on the ranges of southern New Mexico, conducted with a view to control and mitigation of livestock losses. This harmful annual is said to have increased during recent years as the result of overgrazing, and reduction of cattle in order to assure adequate forage is suggested. Also, eradication on small areas through hoeing and in large level areas through dragging or harrowing seems cheapest and most satisfactory. Permanent control seems to be through natural revegetation, although this process takes time.

Grass staggers and magnesium metabolism, I. J. Cunningham (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 4, pp. 424–428*).—Analyses made of samples of pasture, hay, and ensilage from areas where grass staggers occurs and of bones and organs from affected animals have shown that a dietary deficiency of magnesium is not the cause of this disease.

The occurrence of selenium and seleniferous vegetation in Wyoming, I, II (*Wyoming Sta. Bul. 221 (1937), pp. 64, figs. 14*).—This contribution, which is presented in two parts, sets forth a summary of studies which have shown that a number of native plants contain selenium in sufficient amounts to cause serious injury or death to livestock feeding on the plants, and that there is a definite relation between the selenium-bearing vegetation and the rocks and soils of the various geological formations in which the plants are rooted.

I. *The rocks and soils of Wyoming and their relations to the selenium problem*, S. H. Knight (pp. 4–27).—A general description is given of the rocks and soils of Wyoming and their relations to the selenium problem.

II. *Seleniferous vegetation of Wyoming*, O. A. Beath (pp. 29–62).—A more detailed discussion of the relation between the seleniferous vegetation and the various formations, beds, and soils upon which it grows.

"Seleniferous vegetation has been divided into two general groups: (1) Those plants limited to small areas and capable of producing, when eaten by livestock, the 'alkali disease' type of injury; (2) plants, chiefly weeds, occurring widely distributed and capable of producing, when eaten by livestock, the 'blind stagger' type of injury. The sulfur-selenium antagonism theory has been found not to be generally applicable to farm and range practices of the Rocky Mountain region. Naturally occurring selenium-bearing rocks, shales, etc., are discussed with reference to formations and selenium content. Nontoxic seleniferous Steele shale was converted to toxic condition in less than 3 yr. by growing from seeds some of the native seleniferous weeds in situ. Inorganic forms of selenium applied as water solutions of sodium and potassium selenites were found to produce in different soils the same end result, namely, a concentration of selenium in the top soil. Selenium in the form obtained from seleniferous weeds was found to become dispersed by leaching throughout experimental soil plats. In one instance a decided accumulation was found to occur in the lower portion of the test plat. Experiments indicate that the basal Thermopolis shales inhibit the absorption by plants of selenium in artificially selenized soils. Further confirmatory evidence has been found supporting previously published data that native seleniferous weeds influence associated

vegetation through leaching and weathering processes. Droppings from range livestock which have grazed upon or have been fed seleniferous vegetation have been found to carry substantial quantities of selenium. Treatment of livestock poisoned by ingesting seleniferous toxic forages and weeds has been found to be practical in the early stages of the disease. Selenium-containing native vegetation is apparently not as toxic as corn of smaller selenium content."

A list of 20 references to the literature is included.

Alkali disease or selenium poisoning, A. L. MOXON (*South Dakota Sta. Bul. 311 (1937), pp. 91, figs. 30*).—This bulletin has been prepared as a brief review of selenium poisoning and especially the project work conducted by the station. It is pointed out that selenium poisoning in livestock is of two general types, (1) the chronic type, known as the "alkali disease", which predominates in South Dakota, and (2) the acute type, known as blind staggers, that is quite common in Wyoming.

"The toxicity of a large number of different grains has been determined in feeding experiments with albino rats. The symptoms of selenium poisoning in rats involve atrophy and cirrhosis of the liver, hemorrhages in the mucosa of the stomach and small intestines, brashness of the leg bones and intramuscular hemorrhages around the joints of the leg bones, edema, ascitic fluid in the abdominal cavity, anemia, roughness of the coat, and a general loss of vitality. Diets containing a small amount of seleniferous grain will produce a slight inhibition in the rate of growth, while diets made up of larger amounts of the seleniferous grain will produce a distinct inhibition in growth, decrease in food consumption, and characteristic pathology of selenium poisoning. Anemia can be produced experimentally in rats by feeding selenium in the form of seleniferous grains or inorganic selenium (selenate or selenite). A statistical study of toxicity and selenium content of a large number of seleniferous diets has revealed a high degree of correlation between the toxicity and the selenium content of various grains. The relative toxicity of selenium from different sources was wheat > corn > barley > selenate > selenite. The statistical study also showed that diets containing more than 10 p. p. m. of selenium caused a restriction of growth and food consumption, and diets containing selenium in amounts as low as 5 p. p. m. prevented normal growth.

"A comparison of the toxicity of inorganic selenium compounds and other inorganic compounds has shown that in the forms investigated selenium is more toxic than arsenic, vanadium, tellurium, or molybdenum [E. S. R., 77, p. 100]. It was also observed that selenium was the only one of these elements which caused anemia at the levels investigated. . . .

"Certain species of plants have the ability of absorbing selenium from forms which are apparently nonavailable to crop and grass plants. These plants have been called converter plants. Upon decaying these converter plants, among which are several species of *Astragalus*, *Aster*, *Stanleya*, and *Oonopsis*, leave the selenium which they have absorbed in a form which is available to ordinary crop and grass plants. In many areas of South Dakota it is quite evident that converter plants are playing an important role in the selenium problem. Areas which have a reputation of producing toxic vegetation are at the present time infested with converter plants.

"Greenhouse investigations on the selenium problem indicated that the application of sulfur to seleniferous soils might prevent the absorption of selenium by the plants grown thereon. Sulfur in the form of the element and in the form of gypsum was applied to plats in a field which had produced toxic vegetation for the last 24 yr., and the results indicated that sulfur would not

inhibit the absorption of selenium by plants under field conditions. Experimental evidence would indicate that plants absorb more selenium during wet years than they do during dry years. . . .

"The analytical method used for the determination of selenium in various materials is given in detail."

A list is given of 66 references to the literature.

The mechanism of the bacteriostatic action of dyes on the growth of the Brucellae, I. F. HUDDLESON (*2. Internatl. Cong. Microbiol., London, 1936, Rpt. Proc., pp. 35-37*).—Experiments in determining the oxidation-reduction potentials associated with the growth of *Brucella abortus*, *B. suis*, and *B. melitensis* and the effect of the addition of dyes thereon revealed little, if any, difference between the rate of reduction or final Eh level reached in liver infusion broth without dyes. "In the presence of thionine in a final dilution of 1:30,000, it was observed that the reducing intensity of *B. abortus* was inhibited altogether. In the presence of basic fuchsin in a final dilution of 1:20,000, *B. suis* causes little or no drop in the initial Eh of the medium. The presence of the two dyes in the broth does not retard the reducing intensity of *B. melitensis*." The results of these experiments do not show that the selective inhibiting action of the dyes is directly related to a stabilizing effect on the oxidation-reduction potential of the medium.

A modified technic for agglutination in Brucella infection, C. R. DONHAM and C. P. FITCH (*Jour. Infect. Diseases, 59 (1936), No. 3, pp. 287-295*).—Reporting further (E. S. R., 76, p. 97), a description is given of a modified technic of agglutination in which there is a minimum amount of added water in the serum-antigen mixture. "Thus, there is a minimum amount of inhibition of agglutination from this source. Such technic appears to offer a superior method of agglutinin testing, but due to additional cost and a relatively small advantage the method does not seem practical for the routine diagnosis of brucelliasis in animals. Very limited observations suggest that the modified technic described here may provide a better method of testing for undulant fever in man where the slight additional cost per test does not need to be considered."

Observations of pathogenic and antigenic effects of Brucella abortus, United States Bureau of Animal Industry strain 19, C. M. HARING and J. TRAUM (*Jour. Agr. Res. [U. S.], 55 (1937), No. 2, pp. 117-128, pl. 1*).—Subcutaneous injections of guinea pigs and cattle with the slightly virulent *B. abortus* strain 19, transplants of which were obtained by the California Experiment Station in 1932 from the U. S. D. A. Bureau of Animal Industry, are reported upon.

"When grown on glucose-glycerin agar, the strain has apparently remained unchanged in its relatively low virulence for guinea pigs and cattle. When grown in plain broth for about 4 weeks the strain became dissociated so that transplants to glucose agar resulted in a predominance of R-type colonies, but when occasionally renewed by planting from S-type colonies it remained sufficiently stable to be satisfactory for the production of antigen for the detection of agglutinins by the tube and the plate methods. After subcutaneous injection into cattle in doses of approximately 200 billion organisms, the strain has been isolated from the circulating blood up to the twenty-second day, and from the subcutaneous tissues near the point of injection at 14 and 24 days. When injected subcutaneously into pregnant cows, it may produce typical brucellosis with transient bacteremia, exudative and necrotic placentitis, with the discharge of large numbers of the organisms in uterine material at the time of parturition. Cattle vaccinated with strain 19 while nonpregnant have been kept

closely associated with nonvaccinated cattle for over 3 yr. without any evidence of the transmission of infection to the nonvaccinated animals. The vaccination of mature nonpregnant heifers produced, for at least 2 yr., a very definite resistance against the effects of exposure from introducing 1½ billion virulent *B. abortus* into the conjunctival sacs. This resistance may be overwhelmed when larger doses are introduced into the conjunctival sacs, followed by vigorous massage of the eyelids. Infection of adult cows with virulent strains of *B. abortus* produced a stronger resistance to subsequent infection than was produced in younger cattle by vaccination with strain 19.

"The data on results of vaccination between the ages of 4 and 16 mo. are too meager to permit definite interpretation, but they tend to indicate that the agglutination titer usually vanishes within a year and that only a small percentage of such animals are sufficiently protected to withstand severe conjunctival exposure when they are maintained on the low vitamin A intake available in the fall and winter months on the average California coast range.

"The results from hemocultures indicate that calfhood vaccination with strain 19 tends to inhibit the bacteremia that frequently follows conjunctival exposure of cattle with virulent *B. abortus*."

A list of 14 references to the literature cited is included.

Pathogenicity of Brucella abortus for white mice, A. Bee (*Jour. Infect. Diseases, 59 (1936), No. 3, pp. 285, 286*).—The main results of experiments with more than 100 mice weighing about 18 g each are briefly reported. Mice are susceptible to infection by *B. abortus* and react to the smallest doses of the organism. The bacilli were most usually met with in the spleen (about 78 percent); less often in the mesenteric glands (about 56 percent); in the blood and lungs (about 37 percent); in the liver, kidneys, peritoneal exudate, and the semen in the seminal vesicle (about 29 percent); and in the testes (about 20 percent). It was found that the passage of *B. abortus* through a series of mice does not increase its pathogenicity on injection into animals. Thus, mice can be used to determine the presence of *Brucella* in milk, gastric contents of aborted calves, vaginal secretion, etc.

Brucellosis in dogs associated with Bang's disease in dairy cattle, A. L. Delez (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 3, pp. 332–334*).—Two case reports of dogs suspected of harboring *Brucella* infection, one that of a grade English Bull female, the other of a purebred Saint Bernard female, are contributed from the Indiana Experiment Station. The findings have led to the conclusion that dogs do not remain spreaders of *Brucella* infection for any considerable length of time.

Natural and artificial immunity to Bang's disease, R. R. Birch (*Cornell Vet., 27 (1937), No. 2, pp. 161–164*).—A brief review of some of the known facts regarding immunity to Bang's disease, together with a brief reference to new phases of the problem.

Fièvre boutonneuse in Spain and its experimental transmission by ticks.—A preliminary note, C. Ruiz and O. de Landazuri (*Roy. Soc. Trop. Med. and Hyg. Trans., 30 (1937), No. 5, pp. 539, 540, pl. 1, fig. 1*).—A preliminary account is given of boutonneuse or exanthematic fever transmitted by the brown dog tick.

Complement-fixation reaction in hemorrhagic septicemia, R. A. Acevedo (*Philippine Jour. Anim. Indus., 4 (1937), No. 3, pp. 189–204*).—An account is given of an antigen prepared and proved satisfactory for use in the complement-fixation reaction of hemorrhagic septicemia. The results obtained in a limited number of tests showed strong evidences that the complement-fixation reaction

is a promising, quite simple, and reasonably quick test for the diagnosis of hemorrhagic septicemia in cattle and carabaos. The usefulness of the test is said to be limited to the diagnosis of herd infection or recovered isolated cases.

Influenza virus on the developing egg.—IV, The pathogenicity and immunizing power of egg virus for ferrets and mice, F. M. Burnet (*Brit. Jour. Expt. Path.*, *18* (*1937*), *No. 1*, *pp. 37–43*, *figs. 2*).—Egg-passage influenza virus when administered intranasally to mice produces either no lesions or small areas of consolidation only, but effectively immunizes the mice against large doses of highly active mouse-passage virus. Immunity can be produced by a very small dose of egg virus, and appears between the seventh and tenth day after inoculations. Ferrets usually show no symptoms or temperature rise after intranasal inoculation of egg-influenza virus; occasionally an atypical single spike temperature rise occurs. A high grade of immunity demonstrable either by direct inoculation or by titration of serum for specific antibody regularly follows such inoculation. Unlike typical ferret influenza, the infection induced by egg virus is not infectious by contact to another ferret.

A treatment of suppurative keratitis, D. A. Adler (*North Amer. Vet.*, *18* (*1937*), *No. 3*, *pp. 41–44*).—The history of 10 cases of corneal ulcer of the canine and their treatment by the administration of polyvalent antigen separated from normal blood serum (horse), 7 of which were followed by complete and 2 by partial recovery, is detailed in tables.

A bibliography on mastitis, compiled by P. A. Hansen (*New York State Sta. Mimeogr. Bul. 1* (*1934*), *pp. [1]+62*).—This mimeographed reference list, which has been issued in a very limited edition, includes the essential publications on mastitis up to 1933–34. The arrangement is by authors, chronologically.

Studies on neurotropic Rift Valley fever virus (*Brit. Jour. Expt. Path.*, *17* (*1936*), *Nos. 5*, *pp. 352–361*, *pls. 2*; *6*, *pp. 431–441*, *figs. 5*, *pp. 441–447*).—Three papers are presented.

The susceptibility of rodents, R. D. Mackenzie, G. M. Findlay, and R. O. Stern.—It has been found possible, by the intraperitoneal injection of immune serum and the intracerebral injection of Rift Valley fever virus into mice, to bring the latent neurotropic potentialities of the virus to light. "By continued intracerebral passage in mice a 'fixed' strain of neurotropic Rift Valley fever virus can be produced. This virus, when injected intraperitoneally into adult mice, does not give rise to diffuse necrosis of the liver, but immunizes against the pantropic virus. When injected intraperitoneally into very young mice the virus regularly localizes in the central nervous system with the production of encephalitis. In adult mice intraperitoneal inoculation may also in some cases be followed by localization of the virus in the brain. The lesions produced in the brain are those of a true encephalitis associated with degeneration of nerve cells, in which are sometimes seen acidophilic intranuclear inclusions. Rats and field voles (*Microtus agrestis*) succumb to encephalitis following intracerebral inoculation of neurotropic Rift Valley fever virus. Rabbits and guinea pigs are apparently insusceptible."

The susceptibility of sheep and monkeys, G. M. Findlay, R. D. Mackenzie, and R. O. Stern.—The neurotropic strain of Rift Valley fever virus was found to produce encephalitis when inoculated intracerebrally in lambs. Immunity against the pantropic strain follows the subcutaneous injection of neurotropic virus in sheep and lambs. Two species of monkey, *Macaca mulatta*, the rhesus monkey, and *M. irus*, the crab-eating macaque, are highly susceptible to intracerebral inoculation of neurotropic Rift Valley fever virus and die with encephalitis.

"*Spontaneous*" *encephalomyelitis in mice*, G. M. Findlay and R. D. Mackenzie.—Two cases of spontaneous encephalitis in mice which followed intraperitoneal inoculation of pantropic Rift Valley fever virus are recorded.

Studies on hemolytic streptococci.—IV, Streptococcus scarlatinae, A. C. Evans (*Jour. Bact., 34 (1937), No. 1, pp. 21–33*).—This further contribution (E. S. R., 77, p. 396) points out that none of the strains studied was collected from a milk-borne epidemic. The present study was not extensive enough to conclude that *S. scarlatinae* may not infect the cow's udder, and the literature yields no information on this point.

The role of the garbage-fed hog in the production of human trichinosis, M. C. Hall (*Pub. Health Rpts. [U. S.], 52 (1937), No. 27, pp. 873–886, fig. 1*).—This contribution reports finding garbage-fed swine to be infected with trichinae between three and five times as frequently as grain-fed swine, and thus are especially important as sources of human trichinosis.

The action of specific immune serum and of normal human serum on infections of Trypanosoma hippicum Darling in the rat, H. F. Sharrocks (*Calif. Univ. Pubs. Zool., 41 (1937), No. 18, pp. 235–248, fig. 1*).—This contribution is presented with a list of 17 references to the literature.

Bacillary infection and tuberculosis in man and in animals, A. Calmette, rev. and enl. by A. Boquet and L. Nègre (*L'Infection bacillaire et la tuberculose chez l'homme et chez les animaux. Paris: Masson & Co., 1936, 4. ed., rev. and enl., pp. VIII+1024, pls. [25], figs. 69*).—A complete revision of this work, of which the second edition has been noted (E. S. R., 50, p. 584).

The pathology of tularaemia (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 167 (1937), pp. IX+217, pls. 50*).—The contributions on tularemia here presented are as follows: The Pathology of Tularaemia in Man (*Homo sapiens*) (pp. 1–81), Pathology of Tularaemia in the Belgian Hare (*Oryctolagus cuniculus*) (pp. 83–114), Pathology of Tularaemia in the Black-Tailed Jack Rabbit (*Lepus* sp.) (pp. 115–119), Pathology of Tularaemia in the Cottontail Rabbit (*Sylvilagus floridanus*) (pp. 121–126), Pathology of Tularaemia in the Cotton Rat (*Sigmodon hispidus*) (pp. 127–130), Pathology of Tularaemia in the California Ground Squirrel (*Citellus beecheyi beecheyi*) (pp. 131–139), Pathology of Tularaemia in the Mouse (*Mus musculus* and *Mus musculus albinus*) (pp. 141–146), The Pathology of Tularaemia in the White Rat (*Rattus norvegicus albinus*) (pp. 147–154), and The Pathology of Tularaemia in the Guinea Pig (*Cavia cobaya*) (pp. 155–177), all by R. D. Lillie and E. Francis; The Pathology of Tularaemia in the Sheep (*Ovis aries*), by R. D. Lillie, E. Francis, and R. R. Parker (pp. 179–182); The Pathology of Tularaemia in the Opossum (*Didelphis virginiana*) (pp. 183–186), the Pathology of Tularaemia in Other Mammals (pp. 187–202), and Pathology of Tularaemia in the Quail (Bobwhite) (*Colinus virginianus*) (pp. 203–207), all by R. D. Lillie and E. Francis; and The Pathology of Tularaemia in Other Birds, by R. D. Lillie, E. Francis, and R. R. Parker (pp. 209–211).

Lumpy jaw, or actinomycosis, J. R. Mohler and M. S. Shahan (*U. S. Dept. Agr. Circ. 438 (1937), pp. 10, fig. 1*).—A revision of Bureau of Animal Industry Circular 96 (E. S. R., 18, p. 281).

Mastitis.—VI, The effect of feeding irradiated yeast on the resistance of the udder to bovine mastitis, G. J. Hucker and M. S. Reed (*New York State Sta. Tech. Bul. 243 (1937), pp. 10*).—The necessity, in order to avoid mastitis, that cows maintain a considerable degree of resistance to infection because of the widespread presence of the causative organism in the udder led to a study of the effect of feeding irradiated yeast upon the resistance of the udder. In this

further work (E. S. R., 77, p. 248), 116 cows in 4 dairy herds were used, 51 being fed irradiated yeast in the grain mixture. In 3 herds 9 oz. per day per cow and in 1 herd 4.5 oz. per day per cow were fed.

"Prior to the beginning of the feeding of the yeast weekly quarter samples from all cows were subject to laboratory examination over a 4-mo. period to determine the amount of mastitis infection present. Examinations were made for presence of mastitis streptococci, number of leucocytes per cubic centimeter, reaction to bromothymol blue, and physical appearance of the milk. Subsequent to the initiation of the yeast feeding, similar samples were secured for approximately 20 mo. In all, the observations were made on the experimental herds over a period of 2 yr.

"In general the feeding of irradiated yeast was found to have no significant effect upon the resistance of the udder to the invasion of mastitis streptococci. Depending upon the index of infection used, from 10 to 13 percent more of the infected yeast-fed cows showed an improvement than was found in the case of the infected cows not fed yeast. No prophylactic effect was found by the addition of irradiated yeast to the diet of mastitis-free cows."

Black disease of sheep: A new vaccine, W. D. Shew (*Jour. Dept. Agr. Victoria, 35 (1937), No. 1, pp. 21–24, figs. 6*).—Reporting upon black disease or infectious necrotic hepatitis, studies of which by Turner (E. S. R., 64, p. 773) and by Oxer in Tasmania (E. S. R., 67, p. 73) have been noted, the value of a new type of vaccine administered in a single dose, the manufacture of which is based largely on the method originated by Turner, is pointed out.

Observations and researches on hog-cholera in Brazil, A. Braga (*Rev. Dept. Nac. Prod. Anim. [Brazil], 3 (1936), No. 1–6, pp. 17–97, figs. 23; Eng. abs. pp. 60–64, Fr. abs. pp. 64–68*).—The work reported is considered to have proved the existence of hog cholera in Brazil, since in cross-immunity tests both the native virus and the introduced ones produced typical hog cholera. While hitherto hog cholera has manifested generally but little virulence in Brazil, it is advised that sanitary authorities take prompt action in combating it.

Porcine trypanosomiasis in the Gold Coast, J. L. Stewart (*Roy. Soc. Trop. Med. and Hyg. Trans., 30 (1936), No. 3, pp. 313, 314*).—A description is given of three clinical types of *Trypanosoma* infection of swine in the Gold Coast found due to *T. brucei*, *T. congolense*, and *T. simiae*.

Supplementary note to article on equine encephalomyelitis, H. Marsh (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 3, pp. 330, 331*).—In this supplementary note (E. S. R., 77, p. 702), it is pointed out that the close parallel between the disease known in South Africa as staggers or malziekte and described by Theiler (E. S. R., 41, p. 873) as acute liver atrophy and that which occurred in the Western States in the fall of 1936 following the outbreak of encephalomyelitis helps to confirm the view that the condition was not a phase of encephalomyelitis, and that the administration of serum may have been a factor in producing the later losses in areas where the horses had been exposed to the virus of equine encephalomyelitis.

Slow lactose-fermenting bacteria pathogenic for young chicks, K. H. Lewis and E. R. Hitchner (*Jour. Infect. Diseases, 59 (1936), No. 3, pp. 225–235*).—A description is given of the characteristics of three identical strains of bacteria belonging to the colon-typhoid group that were isolated from diseased chicks. "Morphologically and culturally these bacteria exhibit the general characteristics of the group. Physiologically they exhibit a combination of properties which is not identical with that possessed by any known species of the group and which seems to place them in an intermediate position between the colon-aerogenes and paratyphoid subgroups. The organisms are

characterized by their slow utilization of lactose, in that detectable amounts of acid and gas are formed only after 2 to 5 days of incubation. By aging the cultures in lactose broth they acquire the property of fermenting lactose with the formation of acid and gas in less than 24 hr. Once this character has been acquired, it is maintained even when the cultures are grown in a lactose-free medium for a period of 4 mo. A marked tolerance toward brilliant green is exhibited by the organisms. Concentrations of the dye which completely inhibit the growth of laboratory strains of *E[scherichia] coli* show almost no inhibitory effect upon the slow lactose-fermenting strains. Agglutination and absorption-agglutination tests indicate that the organisms are antigenically distinct from the members of the colon-typhoid group included in this study. The slow lactose-fermenting bacteria are pathogenic for chicks and guinea pigs."

Transmission of fowl leukosis, E. P. JOHNSON (*Poultry Sci., 16 (1937), No. 4, pp. 255–260, figs. 2*).—Experiments at the Virginia Experiment Station here reported have led to the conclusion that the chicken mite is capable of transmitting the leucosis agent from an affected bird to well birds under conditions similar to those occurring in nature. Vaccination experiments have shown that the leucosis agent may be transferred mechanically from a leucotic bird to several well birds in a flock by the common procedure of vaccination to prevent chicken pox in fowls. The data obtained emphasize the need for further investigations.

Studies on fowl paralysis.—II, Transmission experiments, E. JUNGHERR (*[Connecticut] Storrs Sta. Bul. 218 (1937), pp. 47, figs. 26*).—In continuation of the studies on fowl paralysis (E. S. R., 73, p. 109), transmission experiments, 8 in number, are reported upon.

Autopsy records of the past 6 yr. are said to have indicated that fowl paralysis and lymphomatous tumors are the prevailing neoplastic diseases of young adult birds in Connecticut. "Out of 7 transmission trials with materials from epidemiologically typical cases of fowl paralysis, 6 transmissible strains were established, 4 of which were carried through repeated passages. Including all failures and recovered birds among the 'no takes', the injection of 128 chicks resulted in 38.2 percent takes, in contrast with a spontaneous incidence of neoplastic diseases of 1.4 percent among 144 controls.

"Three pathologically typical strains of small-cell neurolymphomatosis produced either small- or large-cell lymphomatosis or neurolymphomatosis; one of them also produced giant cell endothelioma. A strain of large-cell lymphomatosis accompanied by small-cell subleukemia produced all of the above lymphomatous forms. One complex strain of lymphomatosis and Rous sarcomalike tumor from the same bird dissociated into the corresponding morphologically and etiologically distinct entities. Although the strains differed somewhat in morphologic range and virulence, evidence of etiologic differentiation between small-cell neurolymphomatosis and large-cell lymphomatosis could not be obtained. The term lymphomatosis should be used, therefore, without cellular qualification for transmissible lymphomatous alterations in the fowl. The concept of lymphocytoma as a pathologic entity in the fowl appears untenable and should be replaced by the restrictive term of hepatolymphomatosis for nontransmissible lymphomatous affection of the liver ('big liver disease') until its position is clarified. No evidence was obtained for an etiologic relationship of lymphomatosis to typical erythro- or myeloid-leucosis in these studies.

"The transmissible factor of lymphomatosis was found to occur in the absence of cultivable organisms, and to withstand desiccation for periods up to 82 days. It was considered to be in the nature of an ultramicroscopic agent.

It was shown to be present in the blood, bone marrow, nerve, and, by indirect methods, in the affected iris. Fresh feces and feces dried for a period of not more than 7 days contained the principle occasionally. Natural transmission through this agent must be considered as being within the realm of possibility."

A list is given of 88 references to the literature.

Shigella nasalis sp. nov., a secondary invader of the nasal passages of chickens, L. E. Erwin, J. P. Delaplane, and H. O. Stuart (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 517–522, fig. 1*).—During the course of studies of upper respiratory infections of fowls at the Rhode Island Experiment Station a Gram-negative rod was isolated. Preliminary observations have indicated that it is a secondary invader, capable of bringing about the coagulation of nasal exudates produced by certain other inciting agents.

A shipment of birds from the Middle West, first observed upon receipt in October 1935 and found to be affected with an upper respiratory disease characterized by a profuse purulent nasal exudate associated with a distinct bulging and swelling of the nasal chambers, was the source. The eyes showed an excessive lacrimation which had dried on the eyelids and which, combined with the swellings, tended to glue them shut. The character of the exudate in the nasal chambers was that of a coagulated purulent material. A nonmotile bacillus, specifically characterized as *S. nasalis* n. sp., was isolated in pure culture from the bulged swellings. This organism alone failed to incite a coryza of the nasal passages, but when combined with *Hemophilus gallinarum* the nasal exudate was of a coagulated purulent nature. Both the exudate and pure cultures of the organism when inoculated in the cloaca incited a reaction simulating in many respects that induced by laryngotracheitis virus. In both instances there was an extension of the infection through the cloaca, in some cases causing peritonitis and death.

Avian tuberculosis, G. S. Harshfield, L. M. Roderick, and M. C. Hawn (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 3, pp. 323–329*).—Data on certain additional features of avian tuberculosis, which supplement the work at the North Dakota Experiment Station (E. S. R., 73, p. 396), are presented.

In an examination either by tuberculin tests of or cultures from 1,411 chicks hatched from eggs laid by tuberculous hens, no infection was detected. The authors consider it extremely doubtful if egg transmission of tuberculosis to the chick is a factor in the dissemination of the disease. In the examination of 246 crows from Cass County, gross lesions of tuberculosis were found in 8, 6 of which were of the avian type. The lesions, usually limited to a few nodules, did not have the disseminated generalized character found in domesticated fowls. In the examination and typing of 19 cases of suspected tuberculosis in sheep found in supervised slaughtering establishments all but 1 were of the avian type.

Virus diseases of chickens, J. R. Beach (*North Amer. Vet., 18 (1937), No. 3, pp. 28–37*).—This review, presented at the Sixth World's Poultry Congress, held at Berlin and Leipzig in 1936 (E. S. R., 77, p. 703), is accompanied by a list of 55 references to the literature.

Control of northern fowl mite, J. A. Davidson and R. Hutson (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 20–23*).—*Liponyssus silviarum*, which made its first appearance in the station pullet flock in January 1936, was found to be effectively controlled by three applications of 40-percent nicotine sulfate to the perches at 3-day intervals, as practiced in combating lice. Sulfur generously applied to the individual bird was an effective control where it was impossible

to use nicotine sulfate on the perches. It is pointed out that the treatment of all birds is necessary for satisfactory control.

A note on the occurrence of a trematode of the genus Clinostomum in a chicken, E. W. PRICE (*North Amer. Vet., 18 (1937), No. 4, pp. 33–36, fig. 1*).—Collection of the trematode parasite *C. attenuatum* Cort from the mucosa of the trachea of a fowl in Nebraska is reported. Notes are given on the life history and source of infection of this fluke, which, so far as is known, is not of any economic importance as a parasite of domestic fowl.

On the coccidia of birds of prey, W. L. YAKIMOFF and S. N. MATSCHULSKY (*Jour. Roy. Micros. Soc., 56 (1936), No. 4, pp. 372–375, pl. 1*).—The coccidid *Caryospora henryi* (Yak. & Matik.) (*C. tremula* (Allen)) was found to infest falcons, kites, and eagle owls kept in the Zoological Gardens of Leningrad.

Diseases of fur animals, J. E. SHILLINGER (*U. S. Dept. Agr., Farmers' Bul. 1777 (1937), pp. II+22, figs. 7*).—This practical account deals with sanitation, infectious diseases, internal parasites causing disease, external parasites, nutritional disturbances, injuries and wounds, and destructive vices of fur animals.

The occurrence of disease among muskrats (Ondatra zibethica) in Great Britain during 1934, T. WARWICK (*Jour. Anim. Ecol., 6 (1937), No. 1, pp. 112–114*).—Of 412 muskrats examined in Shropshire from August 1933 to September 1934, 1 had a diseased liver due to roundworms and the others a lung disease caused in one case by a hemolytic *Streptococcus*.

AGRICULTURAL ENGINEERING

Agricultural engineering: A selected bibliography, compiled by D. W. GRAF (*U. S. Dept. Agr., Bur. Agr. Engin., 1937, pp. 373*).—This mimeographed bibliography lists principally publications of the U. S. Department of Agriculture, the State agricultural experiment stations, and the State extension services from their beginning through 1935.

[Agricultural engineering investigations by the Arizona Station] (*Arizona Sta. Rpt. 1936, pp. 19–28, fig. 1*).—Progress results are briefly presented of investigations on precipitation on the drainage area of the Santa Cruz River above Rillito, Ariz., relation of stream run-off to rainfall, flood danger on the bottomland, ground water, adjudication of water rights within the Santa Cruz Basin, preferential water rights, valley terraces and their relation to groundwater supplies, refinancing of defaulting irrigation and drainage districts, and adobe structures.

[Agricultural engineering investigations by the New Hampshire Station], W. T. ACKERMAN, T. B. CHARLES, G. M. FOULKROD, A. E. TEPPER, R. C. DURGIN, and H. N. COLBY (*New Hampshire Sta. Bul. 296 (1937), pp. 17–19, 20, 21*).—The progress results are briefly presented of investigations on heat requirements for brooding chicks, the use of the V-belt for the power grindstone, electric washing and sterilizing equipment for dairy utensils, an electric fence controller, and alarm systems on poultry fencing.

Human and physical resources of Tennessee.—V, Minerals and mining, C. E. ALLRED, S. W. ATKINS, and W. E. HENDRIX (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 44 (1937), pp. VI+54–69, figs. 6*).—This is one of a series of monographs dealing with the principal economic, social, and civil aspects of Tennessee. It gives general information on the mineral and mining resources of the State.

Surface water supply of the United States, 1936, parts 7, 11, 14 (*U. S. Geol. Survey, Water-Supply Papers 807 (1937), pp. 149, pl. 1; 811 (1937), pp. 331, pl. 1; 814 (1937), pp. 186, pl. 1*).—These papers present the results of

measurements of flow made on streams during the year ended September 30, 1936, No. 807 covering the lower Mississippi River Basin, No. 811 the Pacific slope basins in California, and No. 814 the Pacific slope basins in Oregon and lower Columbia River Basin.

Surface water supply of Hawaii, July 1, 1934, to June 30, 1935 (*U. S. Geol. Survey, Water-Supply Paper 795 (1937), pp. 138*).—This report presents the results of measurements of the flow of streams and ditches in the Territory of Hawaii during the year ended June 30, 1935.

The relationship between tree-growths and stream-runoff in the Truckee River Basin, California-Nevada, G. HARDMAN (*Amer. Geophys. Union Trans., 17 (1936), pt. 2, pp. 491–493*).—This is a brief summary of Nevada Experiment Station Bulletin 141 (E. S. R., 75, p. 205).

The ground-water problem in Oregon (*Oregon Sta. Circ. 124 (1937), pp. 20, figs. 6*).—This circular has been published under a cooperative agreement between the Oregon Experiment Station and the U. S. Geological Survey. It summarizes data pertinent to the subject in several major valleys in Oregon, including the Willamette Valley, the Dalles region, the Harney Basin, the Milton-Freewater district, and the Butter Creek Basin. An appendix describes a 6-yr. program for investigation of ground-water resources of Oregon.

Methods of locating salt-water leaks in water wells, P. LIVINGSTON and W. LYNCH (*U. S. Geol. Survey, Water-Supply Paper 796–A (1937), pp+20, pls. 9, figs. 5*).—This paper discusses 4 general methods of detecting salt water leaks that have been used in studying the problem in water supply wells. In the pumping method, samples taken at measured time intervals while the well is being pumped show by their progressive change in salinity if salt water is being drawn in. In the velocity method, which is suitable for use only in artesian wells, a current meter lowered into the well indicates the location of possible salt water leaks by determining the levels at which there are changes in the rate of upward movement of the water. In the sampler method a container lowered into the well brings up a sample from any depth desired for analysis of its chloride content. The electric conductivity method, for which special apparatus was designed, has been used successfully in the Winter Garden area and Kleberg County, Tex., and in Sarasota County, Fla. The procedure in this method was to lower a pair of insulated electrodes into the well and measure the resistance of the water between them with the Wheatstone bridge or, in waters low in chloride, to apply a direct current of low voltage and measure the current flowing between the electrodes by means of a milliammeter. The instruments showed a marked increase in the conductivity of the water as the electrodes passed from fresh to salt water in the well, leaving no doubt as to the location of the leaks.

[Irrigation institutions and studies] (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 3, pp. 191–198, 281–286, figs. 3*).—Articles are presented in these pages on Comparative Irrigation Institutions in Hawaii and in Continental United States and Some Developments Under Them, by H. A. Wadsworth (pp. 191–198), and The Value of Irrigation Water as a Factor in Interval Control, by H. A. Wadsworth (pp. 281–286).

Scientific irrigation management, H. R. SHAW and J. A. SWEZEY (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 3, pp. 199–279, figs. 33; also Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul. 52 (1937), pp. 199–279, figs. 33*).—This is a review of investigations on plant and water relationships and a report of irrigation investigations by a private concern as they relate to sugar culture. A section also is contained on the administration of plantation irrigation water.

American Farm Bureau Federation, Institute of Irrigation Agriculture, Sixth Annual Conference, Corvallis, Oregon, March 30, 31, and April 1, 1937 (*[Chicago: Amer. Farm Bur. Fed., 1937], pp. [1]+76*).—The proceedings of this conference include special papers on Forecasting the Irrigation Water Supply by Snow Survey, by R. A. Work (pp. 5–9); Irrigation Practice as a Factor in Soil Erosion, by H. E. Reddick (pp. 11–19); A Discussion and Demonstration of the Fundamentals of Soil and Water Relations as Applied to Irrigation Practice, by J. B. Brown (pp. 19–24); The Resettlement Program as it Will Affect Western Irrigation Projects, by W. E. Packard (pp. 27–35); Artificial Recharging of Underground Water Supplies, by A. T. Mitchelson (pp. 42–49); Correlation of Range Land Use With Irrigation Project Needs, by F. R. Carpenter (pp. 52–55); Power Development on Federal Reclamation Projects, by G. Sanford (pp. 56–64); and Factors That Determine the Feasibility of a Reclamation Project, by W. L. Powers (pp. 65–72).

Results of experiments on hydraulics of drop inlets and other erosion control structures, L. H. Kessler (*Agr. Engin., 18 (1937), No. 6, pp. 253–258, figs. 22*).—Results of experiments conducted by the University of Wisconsin Engineering Experiment Station are reported. The objectives were to develop (1) the type of spillway design that would give the greatest discharge, (2) the outlet design that would safely dissipate the energy in the water before it was discharged from the structure, (3) standard designs of the above items that would demand the least amount of steel and concrete, (4) standard designs that could be built by unskilled labor, and (5) the preparation of hydraulic tables and charts for the selection of size and type of spillway structure.

The paper describes briefly the types of structures studied and presents the results of the experiments in tabular and graphic form.

Supplemental irrigation in humid areas, F. E. Staebner (*Agr. Engin., 18 (1937), No. 4, pp. 165–168, 170, figs. 5*).—This is a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering in which technical information for practical use by engineers is reported.

Electric power for irrigation in humid regions (*C. R. E. A. Bul. [Chicago], 7 (1937), No. 2, pp. 23, figs. 30*).—Pertinent technical information on the subject is brought together in form for use by engineers. An appendix gives constants and conversion factors, and a bibliography of selected references on irrigation is included.

Institutional and other small water treatment plants to meet unusual conditions, F. R. Shaw (*Amer. Jour. Pub. Health, 27 (1937), No. 5, pp. 444–452, figs. 4*).—This contribution from the U. S. Public Health Service gives technical information on the design of small water treatment plants.

Preservative treatment of green southern yellow-pine lumber with zinc chloride and zinc chloride-sodium bichromate, E. R. Boller (*Amer. Wood-Preservers' Assoc. Proc., 33 (1937), pp. 262–278, figs. 3*).—This investigation indicated that green southern yellow pine lumber can be impregnated satisfactorily with zinc chloride-sodium dichromate or straight zinc chloride by conditioning with either steam or water at 260° F., subjecting it to vacuum and pressure, and treating with a 5-percent solution of the preservative at 165°. The green pine was heated somewhat more rapidly with water than with steam.

It was also indicated that green pine can be treated satisfactorily with zinc chloride in a somewhat shorter time by conditioning it with the treating solution at 260°, subjecting to vacuum and pressure, and treating with a 5-percent salt solution at from 220° to 260°. A fairly satisfactory treatment with zinc chloride was obtained without application of vacuum following the conditioning period.

By applying a final vacuum it was possible to lower appreciably the moisture content of the treated wood. Generally, treatment reduced the moisture content when the initial moisture content of the green pine was high but raised it when the initial content was relatively low.

Treatment of green pine had no effect upon its behavior in the kiln-drying operation. There was some indication that treatment would reduce deterioration of the pine when dried under adverse conditions.

Treatment of green pine by the methods described and subsequent kiln drying did not affect important strength properties of the material sufficiently to require consideration in stress calculations.

Public Roads [August and September 1937] (*U. S. Dept. Agr., Public Roads, 18 (1937), Nos. 6, pp. [2]+101–120+[1], figs. 19; 7, pp. [2]+121–148+[1], figs. 21*).—These numbers of this periodical contain data on the status of various highway projects receiving Federal funds as of July 31 and August 31, 1937. No. 6 also contains articles entitled Tourist Travel in the United States, by L. E. Peabody and I. M. Spasoff (pp. 101–116), and Effect of Highway Design on Vehicle Speed and Fuel Consumption Studied in Oregon; and No. 7, data on the disposition of (1) State motor-fuel tax receipts, (2) State motor-vehicle receipts, (3) State motor-carrier tax receipts, and (4) receipts from State imposts on highway users, all for the year 1936, and an article entitled A Study of the Passing of Vehicles on Highways, by J. T. Thompson (pp. 121–137).

Construction of private driveways, D. M. Beach (*U. S. Dept. Agr., Misc. Pub. 272 (1937), pp. [1]+30, figs. 26*).—Practical information is given.

Bibliography on highway lighting, compiled by M. A. Wilson (*U. S. Dept. Agr., Misc. Pub. 279 (1937), pp. 30*).—This bibliography has been compiled from the catalog of the Bureau of Public Roads, supplemented to some extent by material from other sources. It includes references to books, periodicals, and publications of societies throughout 1936.

The principles of motor fuel preparation and application, I, II, A. W. Nash and D. A. Howes (*New York: John Wiley & Sons, 1935, vols. 1, pp. XIV+538, figs. 125; 2, pp. XIV+523, figs. 139*).—This contribution is in two volumes. Volume 1 contains chapters on the principles of distillation; the production of motor fuels from petroleum by distillation; the production of motor fuels from petroleum by cracking; the production of motor fuels by the extraction of gasoline from natural gas; the refining of motor fuels; storage, insurance, and distribution; benzole, its production and use as a motor fuel; the production of motor fuels by the hydrogenation process as applied to mineral oils and coals; alcohol fuels; and synthetic fuels and other auxiliary supplies of motor spirits. Volume 2 contains chapters on analysis and examination of motor fuels; sulfur in motor fuels from the automotive standpoint; the formation, estimation, and significance of gum in motor fuels; internal combustion engines; the effect of fuel volatility characteristics on engine performance; knock ratings; motor fuel specifications and properties of motor fuels marketed in different countries; aviation fuels; and automotive Diesel engines and Diesel oils.

Theory of lubrication, M. D. Hersey (*New York: John Wiley & Sons; London: Chapman & Hall, 1936, pp. XI+152, figs. 24*).—This volume is based on a series of lectures aimed to give the scientific background of modern lubrication. It contains chapters on viscosity and its relation to friction, the classical hydrodynamic theory, dimensional theory with applications, temperature rise in bearings, and the problem of oiliness.

Engineering analysis of electric uses on the farm, E. A. WHITE (*C. R. E. A. News Letter* [*Chicago*], *No. 15* (*1937*), *pp. 12–18, figs. 3*).—This analysis, the results of which are presented in tabular and graphic form, is based on data collected on 46 Ohio farms, representing the chief types of agriculture. Dairy, fruit, truck, poultry, dairy and poultry, and general farms were included.

It is concluded that different methods of selecting farms for an engineering analysis of electric uses may be used. It is considered important that the engineering method of analysis applied to electric use as developed by farmers promises to afford information whereby performance may be checked, efficiency improved, and the economic and social benefits of electric service expressed in units which can be universally accepted.

One million farms electrified (*C. R. E. A. News Letter* [*Chicago*], *No. 15* (*1937*), *pp. 2–4*).—Statistical data are reported and analyzed, indicating that the number of farms in the United States served by electricity was 1,042,924 as of December 31, 1936.

New principle in threshing lima bean seed, R. BAINER and J. S. WINTERS (*Agr. Engin.*, *18* (*1937*), *No. 5, pp. 205, 206, figs. 2*).—Results of studies conducted at the California Experiment Station are briefly reported indicating that when the beans were in condition for threshing a slight pressure on the pods distorted them sufficiently to cause them to open along the seam. When this pressure was released the pod separated, throwing the beans out. Mechanical equipment was developed embodying this principle, utilizing rubber-covered steel rolls. This equipment is described.

Artificial drying of forage crops, E. D. GORDON and W. M. HURST (*U. S. Dept. Agr. Circ. 443* (*1937*), *pp. 24, figs. 8*).—In this contribution from the Bureau of Agricultural Engineering in cooperation with 4 other bureaus, information is given on the need for forage driers and on the details of available types. Tests conducted on a small apron-conveyer type and a revolving-drum type are briefly reported.

The results indicate a more efficient utilization of power and heat in the apron-conveyor drier. This was attributed to the scheme of blowing the air counter current to the apron travel for the first half of the apron length. When the apron-conveyor drier was used to dry chopped soybean hay the drying proved to be very uneven and poor, the average discharge moisture content being approximately 20 percent. Practically the same results were obtained with cowpea hay. In drying alfalfa in the rotary drier there appeared to be an increase in thermal efficiency as well as in capacity of the drier due to the shredding of the undried forage with a hammer mill.

Data taken on the effect of maturity on power and fuel requirements showed that the 120-day growth Otootan soybean hay required slightly less power and fuel for dehydration than 80-day growth hay of the same variety. This difference was not due to initial moisture content of the green material.

The thermal capacity for evaporating moisture is affected materially when the forage is reduced to fine particles. The inner parts of the forage plant come in more direct contact with the drying gases when chopped and shredded than when left whole as they are in the apron-conveyor drier.

Data were also taken on several commercial driers operating on neighboring plantations. The performance of these driers is summarized under the heading of "Single-drum" and "Triple-drum." So far as the data show, the large commercial driers were somewhat more efficient in the utilization of heat than the small experimental units.

Information also is given on the use of artificial driers and their operation, on the cost of drying, and on the feeding value of artificially dried hay. Feed-

ing tests in which the dehydrated forage was fed to beef cattle and dairy animals at the Iberia (La.) Livestock Experiment Station have shown that, as compared with the sun-cured product, it will produce slightly greater gains in weight; that the cost of producing the dehydrated product is somewhat greater, thus making the cost of animal gain a trifle higher; that the market grade of the dehydrated product is generally higher; that results of chemical analyses of comparable grade of hay show but slight variations in favor of the artificially dried product. However, in a limited number of tests the carotene content of the artificially dried hay was considerably higher than that of the sun-cured.

Recent developments in grass drying, G. P. Pollitt (*Jour. Roy. Soc. Arts, 85 (1937), No. 4414, pp. 734–743*).—The author briefly reviews experience by himself and others in the artificial drying of grass and hay. It is significant that under British conditions the production of artificially dried hay at costs ranging from £4 to £5 ($20 to $25 per ton) is considered a profitable practice, using drying equipment the first cost of which ranges from $2,500 to as high as $9,000, depending upon local conditions.

Comparative efficiencies of hay storing methods, C. Y. Cannon, E. V. Collins, and D. L. Espe (*Agr. Engin., 18 (1937), No. 4, pp. 153, 154, 157, fig. 1*).—Studies at the Iowa Experiment Station showed that hay cured in the field can be successfully chopped and blown into the hay mow by a hay chopper. Hay was stored in the mow at a faster rate with a hay chopper than with a grapple fork, but the cost per hour of operating the hay chopper was greater than the cost of the additional man and horse labor when the hay was stored with a grapple fork. The cost per ton of chopping and blowing hay into the mow was slightly more than when it was mowed away with a grapple fork. Hay with a high moisture content was relatively more costly to chop than hay with a low moisture content. Chopped hay cured somewhat browner than similar uncut hay. Unless chopped hay is very dry it cannot be expected to cure in the mow without browning. Palatability of hay was evidently not injured by the chopping process, though blackening of hay, whether chopped or unchopped, did injure its palatability.

Investigations on machinery used in spraying, III, IV, C. Davies and G. R. B. Smyth-Homewood (*Jour. Southeast. Agr. Col., Wye, Kent, No. 39 (1937), pp. 61–72; No. 40 (1937), pp. 50–57, figs. 9*).—The third report of these experiments (E. S. R., 76, p. 116) is entitled The Output and Range of Nozzles and Guns. In essence, it indicates that those factors which control nozzle output and range also control the output and carry of spray guns. The range is greater and the number of gallons ejected per minute is larger the greater the pump pressure, the larger the disk aperture, and the narrower the cone of spray. The results indicate that the spray gun is superior to all other spray tools for large- and medium-sized trees.

Part 4, Nozzles, discusses variations in the details of nozzle construction in the field and laboratory tests. No conclusions are drawn.

Removal of spray residue from apples, R. H. Reed (*Agr. Engin., 18 (1937), No. 6, pp. 261–264, 267, figs. 4*).—Experiments on the effect of various washing solutions and types of washing machines on the amount of spray residue remaining on washed apples led to the development of a suitable heating system to maintain the washing solution at the required temperature for the most effective removal of residue. The results are presented and the equipment is described.

Refrigerated apple storages, C. I. Gunness (*C. R. E. A. News Letter [Chicago], No. 15 (1937), pp. 19–22, figs. 5*).—In a brief contribution from the Massachusetts Experiment Station data are presented on the construction, operation,

and cost of operation of refrigerated apple storages under Massachusetts conditions.

Use of fill insulation in the construction of refrigerated rooms, W. M. REES (*Agr. Engin., 18 (1937), No. 4, pp. 159, 160, 163, figs. 2*).—Technical information on the subject is briefly summarized.

The New Jersey two-story poultry house and bill of materials, E. R. GROSS (*New Jersey Stas. Bul. 631 (1937), pp. 24, figs. 16*).—This poultry house is described and illustrated with working drawings, and bills of materials are given for the house with a wood floor and a concrete floor.

Rural cooperative telephones in Tennessee, C. E. ALLRED, T. L. ROBINSON, R. H. LUEBKE, and S. R. NESKAUG (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 45 (1937), pp. III+34, figs. 3*).—This monograph presents briefly the conclusions regarding rural telephones in Tennessee derived from data collected by personal visits to officials of functioning organizations and by the questionnaire and survey method. It includes an account of failures as well as accomplishments.

AGRICULTURAL ECONOMICS

A comparative study of the statistical methods most commonly used in agricultural research, B. G. CAPÓ (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 2, pp. 201–224*).—"This paper comprises a brief and simple explanation of the fundamental principles underlying the use of the statistical methods most commonly used in agricultural research. Among the methods compared are Bessel's method, the deviation from the mean method, Fisher's method for the analysis of variance (including the following phases: Unrestricted method, method of randomized blocks, method of Latin square), and 'Student's' method for paired observations. An example for the application of each method and new tables devised to test exclusively whether a difference is statistically significant or not are also presented."

[Investigations in agricultural economics by the Kansas Station, 1934–36], H. HOWE, G. MONTGOMERY, H. J. HENNEY, F. L. PARSONS, and J. A. HODGES (*Kansas Sta. Bien. Rpt. 1935–36, pp. 22–27*).—A brief report is given of (1) the relation of assessed and sales value of farm lands, 1923–33, and of such values, 1931–33, for 2,935 properties grouped on the basis of sale price; (2) the percentages of properties tax delinquent, 1928–32, in 31 counties, the average period of delinquency, etc.; (3) the effects of volume of grain business, margins, side line business, etc., on profits of cooperative elevator associations; (4) relation of fall precipitation to wheat yields in western Kansas; (5) relation of current production and anticipated production during the succeeding year in hard wheat States on the premiums for high protein wheat; (6) the increase in the community auction and interior packing systems of marketing livestock; (7) the effects of dry grazing seasons on the time the cattle are marketed; (8) the effects of supplies of apples and peaches from different sections on prices in Omaha and Kansas City markets; (9) the increase since 1932 in the percentages of Kansas potatoes shipped to points east of the Mississippi River; (10) the effects of size of pay rolls and consumer's income on the consumption and price of butter; and (11) some relations of the poultry enterprise to the farm income and its distribution throughout the year.

[Investigations in agricultural economics by the New Hampshire Station, 1935–36] (*New Hampshire Sta. Bul. 296 (1937), pp. 5, 6, 22, 23*).—Included are findings as to the past and present land utilization and depreciation of tillage land in southern Grafton County, by H. C. Woodworth, and a table by

Woodworth and A. Hangas showing the average receipts and expenses on 88 dairy farms in the Colebrook area covering the calendar year 1934.

[Reports of Department of Agriculture and Forestry, Union of South Africa, 1934–35 and 1935–36], P. R. VILJOEN ET AL. (*Farming in So. Africa, 10 (1935), No. 117, pp. 491–597, figs. 9; 11 (1936), No. 129, pp. 493–617, figs. 13*).—The report covering the year ended August 31, 1935 (E. S. R., 72, p. 707), discusses helping the farmer and rehabilitating the agricultural industry, the economic aspect of agriculture, boards and levies, administrative activities, agricultural research, and agricultural extension and education. Reports of the heads of the several divisions, services, etc., are also included.

The report covering the year ended August 31, 1936, deals with the protection and strengthening of the agricultural industry, the position of the main branches of farming, the marketing side and marketing problems of agricultural production, reports of the heads of the different departments, services, etc. The report of the division of economics and markets includes a study by C. H. Spamer and B. J. van Niekerk of the costs of distribution, 1930–34, from producer to retail dealer of maize and maize products through private and cooperative trade channels, and a table with discussion showing the functioning of the maize market during the 1934–35 and 1935–36 seasons under the partial control prescribed in the Mealie Control Acts.

Foreign Agriculture, [July–September 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), Nos. 7, pp. 315–370, pls. 3; 8, pp. 371–422, pl. 1, figs. 9; 9, pp. 423–468, fig. 1*).—Included in No. 7 are articles on Cotton Production in British East Africa, by P. K. Norris (pp. 317–340); Long-Range Weather Forecasting in Germany, by G. P. Boals (pp. 341–350); and The Austrian Hog Industry and the Market for American Lard, by H. E. Reed (pp. 351–366); and notes on Rumanian Government plans reorganization of agriculture, Portugal adopts corporative form of agriculture, and Cuban Government considers land distribution scheme.

No. 8 includes articles on British Imperial Preference—Its Relation to United States Farm Exports, by H. L. Franklin (pp. 373–392); and Argentine Corn, by P. O. Nyhus (pp. 393–418); and notes on British agricultural policy, Argentina authorizes establishment of a meat-marketing agency, Italian agricultural policy, and Argentina organizes wool research institute.

No. 9 includes articles on Farm Tenancy and Japanese Agriculture, by W. Ladejinsky (pp. 425–446); Crop Insurance in the Soviet Union, by L. Volin (pp. 447–452); and The Cuban Winter Vegetable Industry (pp. 453–464); and notes on United Kingdom adopts permanent beef-cattle policy, Greece to confiscate surplus currant acreage, and Danube countries to continue wheat-relief measures.

Denmark agriculture (*København (Copenhagen): Agr. Council, 1935, pp. 324+LIII [figs. 191]*).—This publication was prepared to show "the development which Danish agriculture has undergone and the contribution made by Denmark within the field of agriculture." Sections are included on Division of the Land, and Social Conditions, by H. Jensen (pp. 19–26); The Cultivated Area and the Yield of the Harvest, by H. K. Olsen (pp. 27–36); The Organisation of Danish Agriculture, by A. F. Knudsen (pp. 37–48); Cooperation in Danish Agriculture, by A. A. Drejer (pp. 49–58); Education, General and in Rural Economy, by N. Bredkjaer (pp. 59–70); The Farmer and His Homestead—Habitations and House Culture in the Rural Districts, by K. Rasmkjaer (pp. 71–80); Reclamation of Land, by N. Basse (pp. 145–158); Danish Agricultural Import and Export, by P. A. Moltesen (pp. 287–302); Agricultural Prices, by I. Dokken (pp. 303–316); and The Financial Results of Danish Agriculture, by O. H. Larsen (pp. 317–324).

Other sections deal with the soils, soil improvement, plant culture and improvement, public measures for the furtherance of plant culture, animal production and breeding, the dairy and poultry industries, and agricultural research and experimentation.

World cotton production and trade, A. Brizi (*Internatl. Inst. Agr. [Rome], Studies Princ. Agr. Prod. World Market, No. 1 (1936), pp. XII+462, pls. 16, figs. 17*).—This is the first number of a series of studies of the principal agricultural products on the world market. The geography of cotton production is described by countries or regions in the humid, subhumid, and arid or semiarid zones and also the national aspects of cotton production. Primary marketing, cotton prices in relation to production, cotton price movements on the eve of the depression and from 1929–30 to 1935–36, cotton policy of the Government in the United States and Egypt, cotton growers' returns and costs, exports of different countries, the world cotton situation by years, 1929–30 to 1935–36, the commercial policy of the United States as a permanent factor affecting the structure of the world cotton market, and the Agricultural Adjustment Act as a factor in recovery from the economic crisis are discussed. The international aspects of the cotton industry, the imports and consumption of cotton by the cotton textile industries in domestic consumption, and exports of cotton goods, etc., by different countries are also discussed.

Tobacco shrinkage and losses in weight in handling and storage, J. V. Morrow and D. Smith (*U. S. Dept. Agr. Circ. 435 (1937), pp. 77, figs. 8*).—"The purpose of this circular is to analyze the factors causing shrinkage and losses in weight and to make a practical application of the uses of these factors in the statistics of tobacco held in storage. The factors of loss in weight are (1) losses of particles of dirt and tobacco in cleaning and packing, (2) reduction in moisture content and chemical changes during fermentation, and (3) loss due to removal of stems or midribs of the leaves."

Tables show for the different southern types of tobacco the average percentages of loss in weight resulting from cleaning, handling and packing, sweating and drying in storage the first, second, and third years, and stemming, and for different cigar-leaf types the average percentages of loss resulting from handling and bulk sweating, sweating and spoilage in package, sweating and drying in storage the first, second, and third years, and stemming. A table of conversion factors for adjusting for losses in weight incident to stemming, handling, sweating, and drying is included.

"To arrive at definite consumption figures, stocks should be converted to a farm-sales-weight basis—the equivalent of the weight at the time of sale by the grower—thereby making the figures of leaf-tobacco stocks comparable with figures of leaf-tobacco production. The stemmed leaf reported should be converted to an unstemmed basis, taking into acount the loss due to the removal of the stem. Then adding this to the unstemmed leaf reported, the total should be converted to a farm-sales-weight basis, taking into account the average losses in handling and shrinkage."

Tables show the stocks of different types of tobacco owned by dealers and manufacturers in the United States as reported to the Bureau of the Census and the Department of Agriculture and on a converted-weight basis semiannually, 1912–16, and quarterly, 1917–36. The normal movement of tobacco of different types from growers' hands into the hands of dealers and manufacturers is described.

Marketing fruits and vegetables in Connecticut, with special reference to the Hartford, Bridgeport, and Waterbury markets, G. B. Clarke (*[Connecticut] Storrs Sta. Bul. 217 (1937), pp. 70, figs. 14*).—This is a continuation

of the study previously noted (E. S. R., 74, p. 560). Data for 1934 on buying practices of retail stores were obtained from 261 stores in Hartford, 173 in Bridgeport, and 318 in Waterbury. During the summer of 1935 a survey was made of market gardening in 56 towns in New Haven, Hartford, Fairfield, Litchfield, and Middlesex Counties. The data from the retail store survey are analyzed to show for the three cities the weekly purchases of stores of different sizes, the sources of purchases, volumes of native and other purchases of different fruits and vegetables during the native season, etc. Comparisons are made of the local and shipped-in receipts of different products and the methods of transportation used for shipped-in products. The data from the market garden survey are analyzed to show by counties the number of farms, acreages of crop land, acreages, net and total sales, and types of outlets for fruits and vegetables, transportation methods used, etc. The farmers' markets in Hartford, Bridgeport, and Waterbury are described. The Connecticut Department of Agriculture cooperated in the two surveys. Appendixes include the schedules used.

The market for fresh fruits and vegetables in Peoria, S. W. Decker and J. W. Lloyd (*Illinois Sta. Bul. 435 (1937), pp. 57–112, figs. 11*).—The data for this study were collected chiefly in 1935, a few additional facts being obtained in 1936. The character of the wholesale markets of the city are described, with information as to carlots of different fruits and vegetables unloaded, receipts by truck, and sources of fresh produce. The quality and varieties of fresh products carried by retail stores of different types, retail prices and margins, sources of supplies, etc., are analyzed. Using data obtained in interviews with 1,082 families selected at random in 10 wards of the city, the use of fresh vegetables and fruits, home production of vegetables, home canning, sources of fresh vegetables, etc., are discussed. The use of fresh fruits and vegetables in eating establishments and potato preferences and methods of serving are discussed, using as a basis data gathered in a survey of 15 typical eating establishments. The trends in methods of purchasing fruits and vegetables in recent years are discussed. The operation of, quality of produce, prices obtained, etc., on the Peoria Central Market are also described.

Some recommendations are made for improving the marketing.

The Baltimore wholesale fruit and vegetable markets, R. F. Burdette and S. H. DeVault (*Maryland Sta. Bul. 409 (1937), pp. 389–444, figs. 14*).—Five wholesale markets in Baltimore received fresh fruits and vegetables direct from country shipping points. Data were obtained from actual records regarding the receipts of different commodities at railroad terminals and wharves and the total fruit and banana auction sales. Data for the Marsh and Camden markets are based on questionnaire records obtained from most of the operators on the markets and detailed records from a few representative firms. Data were also obtained from members of the produce trade, chain stores, and others.

The development, organization, channels of distribution, problems, etc., of the different markets are analyzed and discussed. The disadvantages to wholesalers and jobbers, large and out-of-town buyers, and retailers, the lack of correlation in selling hours, and the excessive delivery costs due to split conditions of the markets and the ethics and problems of the dealers are also discussed. Recommendations founded on the data and observations of those conducting the study are made as to possible methods of solving the present marketing problems of the city.

Statistical analysis of the annual average f. o. b. prices of Pacific Coast canned Bartlett pears, 1926–27 to 1936–37, H. R. Wellman and M. D. Street (*California Sta. Mimeogr. Rpt. 61 (1937), pp. 7, fig. 1*).—From this

analysis it is concluded that "on the average (1) an increase in total shipments of canned pears from 4,000,000 cases to 4,500,000 cases has been accompanied by a decrease of 18 ct. a case in the average f. o. b. price, and vice versa; (2) a change of 10 points in the index of nonagricultural income has been accompanied by a change in the same direction of 48 ct. a case in the average f. o. b. price; and (3) a change of 10 points in the adjusted index of prices of competing canned fruits has been accompanied by a change in the same direction of 35 ct. a case in the average f. o. b. price."

The history of milk prices: An analysis of the factors affecting the prices of milk and milk products, R. L. COHEN (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1936, pp. XIII+205, [figs.] 11*).—"This study is an attempt to show, both analytically and statistically, the factors which have determined the prices and supplies of milk and milk products during the pre-war period of individual buying and selling, the period of war-time control, the post-war period of partially organized bargaining, and the period, up to the end of 1934, when the milk marketing scheme was in operation."

Government measures affecting agricultural prices (*Internatl. Inst. Agr. [Rome], Govt. Measures Affecting Agr. Prices, 1 (1935), Nos. 1, pp. [2]+52; 2, pp. [2]+53–116; 3, pp. [2]+117–168; 4, pp. [2]+169–208; 2 (1936), Nos. 5, pp. [2]+52; 6, pp. [2]+53–96; 7, pp. [2]+97–144; 8 pp. [2]+145–164; 3 (1937), Nos. 9, pp. [2]+32; 10, pp. [2]+33–68*).—In this international quarterly summary of Government measures affecting the prices of cereals, meats, and dairy products, a summary is made of the most recent Government measures affecting prices of the more important agricultural commodities. The measures for each product are given, with citations, by countries in order of date of coming into force and are grouped as follows: Provisions for the internal control of home-produced goods, import duties and other taxes on imported goods, quotas and import prohibitions, measures affecting exports, and foreign exchange provisions affecting trade in agricultural goods. No. 1 summarizes the position on December 31, 1934, and lists changes to date in Germany, France, Great Britain and Northern Ireland, Italy, and the Netherlands; No. 2, Belgium and Luxemburg, Canada, and the Irish Free State; No. 3, Australia; No. 5, Cuba, Denmark, the United States, Finland, and Poland; No. 6, Czechoslovakia; and No. 7, French North Africa, Japan, Mexico, New Zealand, and Switzerland.

No. 8 includes notes on Canada, the Irish Free State, France, Italy, the United Kingdom ,and Czechoslovakia. No. 9 includes "legislation concerning market organization in Germany, the soil conservation program for 1937 in the United States, the new customs tariff in France, marketing schemes in the United Kingdom, [and] price-fixing measures in Italy and Switzerland. Only the three groups—cereals, meat, and dairy products—are dealt with." No. 10 includes the "agreement of the Oslo Convention States for developing foreign trade; import quotas in France; details concerning the application of the legislation on cereals in the Irish Free State, the Netherlands, and Sweden, and of that on dairy products in the Netherlands, Sweden, and Switzerland; the new wheat prices in Italy; [and] the proposed agricultural policy of the United Kingdom."

Report of proceedings under the Agricultural Wages (Regulation) Act, 1924 (*[Gt. Brit.] Min. Agr. and Fisheries, Rpt. Proc. Agr. Wages (Regulat.) Act, 1933–34, pp. 64*).—The more important features of the working of the act during the year ended September 30, 1934, are reviewed, and detailed information of importance to committees fixing the minimum wages and organizations representing employers and workers, are described.

Farm leases for Illinois, H. C. M. Case and J. Ackerman (*Illinois Sta. Circ. 474 (1937), pp. 43*).—Four types of leases—cash, crop share-cash, livestock share, and manager-tenant—are described and the advantages and disadvantages of each indicated. A sample lease of each type except the cash lease is included. An analysis is made of leases used in the Corn and Wheat Belts. Suggestions on making farm leases and discussions of the adjustment of cash rental to a changed price level, contributions of tenants and landlords under different forms of leases, and the adjustment of farm expenses between tenant and landlord are included.

Demand deposits of country banks, N. J. Wall (*U. S. Dept. Agr., Tech. Bul. 575 (1937), pp. 27, figs. 7*).—The relative importance of banks in places of less than 15,000 population as a source of agricultural credit is discussed. Using the 20 States having the highest average cash income from farm production, 1924–29, an index was constructed of demand deposits. Regional index numbers were also constructed using 8 States representative of the cotton-growing section, 7 representative of the Corn Belt, and 8 of the mountain or range States. Tables and charts show the monthly indexes, May 1923 to December 1936, inclusive. Demand deposits of country banks as a measure of agricultural purchasing power are discussed, with charts showing the relationship of indexes of demand deposits and farm income (1923–36), prices received by farmers (1923–36), and volume of rural retail sales (1929–36). Country bank deposits as a measure of availability of credit for farmers and the influences of type of farms and loans from Federally sponsored agencies on the seasonal movement of demand deposits are also discussed.

Tax delinquency of forest land in Arkansas, 1932–1933, R. B. Craig and O. J. Hall (*Arkansas Sta. Bul. 340 (1937), pp. 70, figs. 5*).—"The purpose of the study has been to prepare and recommend practical measures for handling and using tax-forfeited lands in Arkansas. To accomplish this purpose, it was necessary to determine the location, extent, character, and status of tax-forfeited and tax-delinquent lands in representative counties; the causes of delinquency, particularly as they relate to forest lands; and the utility of tax-forfeited land for forest production."

Four counties—Little River, Washington, Johnson, and Lee—selected on the basis of forest types and extent of delinquency during the past 5 yr., were studied intensively. A map was prepared for each county, showing the tax history of every parcel of rural land in the county during the period studied. The general plan of sampling used to determine the tracts to be visited was to strip-line the county on a township basis, first vertically, then horizontally, to include about 50 percent of the forfeited land, about 15 percent of the delinquent land, and from 2 to 5 percent of the nondelinquent land "The data taken on each plat in the sample included the location (part of section, section, township, range); tenancy of tract and residence of owner; status of delinquency; area in crop, pasture, idle land, abandoned land, forest, and other land; the forest type, stocking and character of forest growth, and the site index and stand per acre, if obtainable; the topography, stoniness, and erosion for each land use; the accessibility to market, school, and store, and the character of improvements (except in Little River County); and the assessed valuation and taxes as of last assessment. Where the trees in the forest or wood lot averaged 8 in. or more in diameter at breast height, a 5 percent cruise was made to obtain the stand per acre in board feet, and the site index (i. e., the average height of the dominant and codominant trees at 50 yr. of age was used as a measure of productivity of the site in terms of tree growth)."

The general conditions of the State, forest types, forest ownership, and trends in tax delinquency are discussed. For each county the location and physiography, population and industry, forests (history, types and stocking, ownership, utilization, etc.), the extent and status of tax-distressed lands, the possible causal factors in delinquency (valuation and tax per acre, ownership, condition and management), and the utility of forfeited land for forest production are discussed. Recommendations are made as to types of surveys, revision of tax laws and practices, and demonstration and extension work in forestry needed to effect improvement in the forest land tax delinquency situation.

The farmer and the cost of local rural government in Missouri, C. H. Hammar and G. T. Barton (*Missouri Sta. Bul. 385 (1937), pp. 90, figs. 22*).—This bulletin is based chiefly on data from 11 counties in different parts of the State. County financial statements covering the period 1914–34, annual reports of the State Board of Education, and semiannual reports of the State auditor formed the chief sources of the data. An analysis is made of the relations between the average total expenditures, 1930–34, and population, area, total assessed valuation, rates of taxation, etc., and between total expenditures per capita and total assessed valuation per capita. The expenditures for various purposes are analyzed and discussed, and their relations to assessed valuations and populations of the counties considered. The trends of and factors affecting growth of expenditures are discussed. The problems of efficiency of schools and of efficiency in relation to roads and salary and fee expenditures, in the care of the poor, and other aspects are dealt with. A section deals with governmental reform in relation to land use and the distribution of population.

The possible savings that would result from the consolidation of counties is discussed, with the conclusion that "in total, therefore, it appears that expenditures for schools and roads, which constituted in 1930–34 in these 11 counties 72.9 percent of all expenditures, would be affected almost not at all by county consolidation; and that expenditures for the other 27.1 percent would be affected only moderately. The net effect would, therefore, almost certainly be limited though the total absolute savings might amount to several thousand dollars per annum for each consolidated unit. Attention should again be called, however, to the fact that these are merely governmental savings and not community savings since there would unquestionably be some additional costs in transacting business with the government on the part of the citizens who, in a large county, would be living at much greater average distances from the county seat."

Three procedures are suggested and discussed for reducing the differences in cost between the wealthier and poorer counties, namely, (1) increase in the responsibility of the State for costs of local government, (2) resettlement to reduce population and increase the ratio of taxable resources to population, and (3) increase of taxable wealth by increasing the productiveness of the underlying natural resources in certain areas.

Land use in Mohawk area [Arizona] (*Arizona Sta. Rpt. 1936, pp. 18, 19*).—Brief findings in an economic analysis of the Mohawk Municipal Water Conservation District are included as to present and possible future water supplies, costs of water, and the ability of the district to pay taxes and indebtedness.

Influence of tenancy on types of farming and agricultural income by soil types, Minidoka irrigation project, P. A. Eke and H. F. Brown (*Idaho Sta. Bul. 222 (1937), pp. 29, figs. 13*).—This study was made on the Minidoka irrigation project, located in Minidoka and Cassia Counties. The materials used consisted largely of annual reports gathered by the ditch riders. The acreages of crops and numbers of livestock on all farms for the years 1929–31 and the

yields, 1927–31, on all farms in a survey section selected by soil types were tabulated. Survey records were taken in 1932 to give rotation and yield records of many fields on the different soil types.

The history of the development, markets, soil types, and importance of crops on the project are described. Maps show the soil types in the project and the distribution in 1929 of owner- and tenant-operated farms. Graphs show for each soil type for farms of from 25 to 55 acres and from 60 to 80 crop acres, tenant-operated and owner-operated, the percentages of crop acres in important crops. Tables are included and discussed showing the relation of tenancy to size of farm, kinds of crops grown, crop yields, gross value of crops, livestock production, and capital investment. Some of the findings were:

Tenants tend to operate larger farms than owners, especially on the poorer soil and in locations near the boundaries of the project. There was a tendency for tenants to farm the larger farms with less intensive crops than did owners. Tenants' crop yields were lower by from 2.5 to 15.6 percent on the various types of soils, the difference being greater on sandy soils than on heavy soils. Tenants' yields were considerably lower where the tenants shifted frequently. The average gross value per acre of all crops was $74 for owners and $66 for tenants on the smaller farms and $72 and $64, respectively, on the larger farms. Tenants kept only approximately two-thirds as much productive livestock as owners, had a smaller number of horses, and a smaller investment in farm machinery and equipment.

Practices on Iowa farms, J. A. Hopkins and W. D. Goodsell (*Iowa Sta. Bul. 360 (1937), pp. 21–52*).—"The actual experiences of some 400 farm operators, as shown by questionnaires obtained from these farmers in 1934 supplemented by financial records kept by each farmer in 1933 and 1934, form the basis for this economic study of farm practices."

Tables are included and discussed showing the effects of selected practices in corn and oats production, and of hay and pasture, hog, and poultry management on production. The effect of the activity of a farm management association in bringing about the modification of farm practices is also discussed.

Corporate-owned land in Iowa, 1937, W. G. Murray and H. W. Bitting (*Iowa Sta. Bul. 362 (1937), pp. 93–127, figs. 18*).—"To determine the amount and location of corporate-owned farm land and to consider the bearing of corporate land on tenancy and land ownership questions are the purposes of this bulletin."

Tables and charts show by counties and for the State as a whole (1) the acreages and percentages of total farm lands owned by different types of corporations, January 1937; (2) the acreages owned by corporations, 1933–34, 1935, and 1937; and (3) the acreages acquired and sold by corporations, January 1935 to January 1937. The reasons for existing distribution of corporate-owned lands, totaling in January 1937 11.2 percent of the farm land in the State, are discussed. The effects of corporate-owned lands on tenancy and the problems of the purchase of such lands by tenants are also discussed.

Livestock production in Iowa as related to hay and pasture, W. W. Wilcox (*Iowa Sta. Bul. 361 (1937), pp. 53–92, figs. 15*).—The possible effects on livestock production in Iowa of the program to grow more grass and less grain, particularly corn, are discussed on the basis of an analysis made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

"Four findings which are fundamental to the development of a sound long-time agricultural program for the Corn Belt have grown out of this analysis. (1) Moderately increased acreages of soil-conserving crops may be expected to have little effect on total production in the State, except over a long period of time, tending to maintain it at a higher level than would be possible if

present depletion is allowed to continue, especially on the highly erodible soils. (2) Elasticity in the use of Iowa feeds by the different classes of livestock is sufficiently great to suggest that a 10 percent reduction in grain accompanied by a corresponding increase in hay and pasture will not, in itself, have any significant effect on the type of livestock and livestock products produced in Iowa. (3) Increased acreages of hay and pasture on many present grain-selling farms may be expected to be accompanied by increased livestock production on these farms. The motive for increased livestock production set up by the production of additional nonsalable roughages may be expected to result in more livestock being kept—both hogs and cattle—resulting in significantly less grain being shipped from these farms. (4) The feeding of a higher proportion of grain on the farms where it is raised will make the problem of soil conservation and the maintenance of an adequate volume of business even more acute on the present small, highly erodible farms, where additional grain is now purchased, both within and outside the State."

Land use and soil conservation practices in Lenawee County, E. B. HILL and H. B. TAYLOR (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 23–28*).—This article analyzes the data for 97 farms in two townships in 1936 along the same lines as previously noted for Mecosta County (E. S. R., 77, p. 714).

The returns for operator's labor and management averaged $892 per farm on the farms with less than 30 percent of the rotation in hay and pasture and $739 on those with over 30 percent. Reports of 50 of the farmers indicated increases from 1930 of 23 percent in acreage of legume hay and 2 percent in wheat and decreases of 32 percent in nonlegume hay, 3 percent in small grains other than wheat, and 2 percent in corn. The acreage in rotation pasture remained about the same. The number of hens increased 15 percent, ewes 6, cows 2, and beef cattle 145 percent. The number of sows decreased 25 percent. Further changes from the 1935 acreages of crops and numbers of livestock were contemplated as follows: Increases, wheat 10 percent, legume hay 10, cows 20, hens 41, sows 16, and ewes 17 percent; decreases, nonlegume hay 17 percent and beef cattle a slight decrease.

Economic studies of vegetable farming in New York.—II, Market-garden farms without greenhouses, Rochester area, J. L. PASCHAL ([*New York*] *Cornell Sta. Bul. 673 (1937), pp. 36, fig. 1*).—This is the second bulletin of the series previously noted (E. S. R., 77, p. 867). Data were obtained from 125 farms for the year ended March 31, 1933, and from 72 farms for the year ended March 31, 1934. Tables are included and discussed showing the distribution of capital; receipts from vegetables, fruits, and other crops, livestock, and miscellaneous sources; expenses; and labor income. The effects of economic conditions, acreage in farm, acreage in vegetables, amount of labor used and labor efficiency, crop yields, and age and schooling of operator on labor income are discussed. An analysis is made of the costs of marketing, showing the number and costs of trips to market, value of produce sold on the market and per load, and the cost of operating trucks. The more important business analysis factors for the farms studied are shown in a table. A farm-management-efficiency program based on the study includes the following: "Favorable size of business—(1) more than 15 acres of vegetable crops, (2) a minimum of capital necessary to provide 15 acres or more of vegetable crops on a good vegetable soil within convenient distance of an important market (usually $12,000 or more per farm is required in the area studied); good rates of production—(3) an index of vegetable crop production 25 percent or more above the average for the region; labor efficiency—(4) 9 acres of vegetable crops per man or more—(5) more than $1,600 receipts per man; efficiency in marketing—(6)

cost of marketing not in excess of $15 per $100 sales; [and] efficiency in the use of capital—(7) capital employed not in excess of 3.5 times the annual receipts."

The milksheds of New Hampshire: A study of their characteristics and relationships, A. MacLeod (*New Hampshire Sta. Bul. 295 (1937), pp. 11, fig. 1*).—This is the first publication of this station in the New England milk marketing study sponsored by the New England Research Council. It describes the study of characteristics and relationships of the milksheds in New Hampshire. Tables are included showing daily distribution (1935–36) of milk and cream by dealers and producer-distributors by city or town, the approximate number of cows on farms in each milkshed supplying local markets and other large markets, and the approximate number of cows by counties on farms shipping milk out of the State and supplying local needs. Maps are included illustrating the differences and similarities occurring in the Claremont, Keene, and Laconia milksheds.

Land utilization in New Hampshire.—I, Problems in the back highland areas of southern Grafton County, H. C. Woodworth, M. F. Abell, and J. C. Holmes (*New Hampshire Sta. Bul. 298 (1937), pp. 70, figs. 34*).—"This bulletin reports a land use study of an area in southern Grafton County, N. H., where approximately 190,000 acres of rough upland—mountains, hills, and small valleys—is inhabited by 289 families." Records comprising "a brief inventory of the farm and livestock, acres of crops, income from sales, outside work and other sources, farm expenses, personal living expenses, a brief record of personnel in the household, and a few items on social activity of the families" were obtained from 252 of the families by personal interviews. The physical and climatic features of the area are described. The agriculture; forestry; use of lands for summer homes and recreational purposes; the number, condition, etc., of houses; and the age, family status, years on present farm, training of farm operators and their income and cash living expenses are discussed. The problems of public finances, particularly roads and schools, are dealt with. Four interrelated programs for improving the conditions in the area—realignment of people, reorganization of local government, developing resources, and relating people to resources—are suggested and discussed.

Type-of-farming areas in New Hampshire, H. C. Grinnell (*New Hampshire Sta. Circ. 53 (1937), pp. 14, figs. 2*).—A State enterprise map was prepared showing the location, type, size, intensity of agriculture, etc., of 6,526 commercial farms in the State. Based on this map, a map was prepared dividing the State into the following type-of-farming areas: (1) Dairying—(*a*) retail milk, (*b*) wholesale milk, (*c*) wholesale milk with potatoes, (*d*) wholesale milk with pulpwood, (*e*) wholesale milk and hens, (*f*) wholesale milk, apples, and hens, and (*g*) wholesale milk, hens, apples, and vegetables; (2) hens, wholesale milk, and apples; (3) apples, wholesale milk, and hens; and (4) highland farming. Nonagricultural lands are also shown. The areas are briefly described and tables included showing for each data as to population, area, number of farms, use of land, number of cows, volume of eggs and potatoes produced, number of fruit trees, etc.

Types of farming and farm business studies in South Carolina, J. L. Fulmer (*South Carolina Sta. Bul. 310 (1937), pp. [91], figs. 39*).—The physical and economic factors affecting the agriculture of the State are described. Maps and charts are included and discussed showing by counties the utilization of lands, acreages in different crops, the numbers of livestock, and the production of some livestock products. The State is divided into nine type-of-farming areas. The types of farms, farm enterprises, factors influencing de-

velopment, farm tenure, etc., for each area are described. In those areas where farm management surveys had been made, tables are included showing business factors on average- and typical-sized owner-operated farms and for the better farms of each of these groups.

1936 onion production costs in Michigan, K. T. Wright (*Michigan Sta. Quart. Bul., 20 (1937), No. 1, pp. 11–13*).—This article continues the study previously noted (E. S. R., 75, p. 866). Records for 1936 were obtained from 39 growers and anaylzed as in the previous report.

Milk-production costs in West Virginia.—II, A study of the costs incurred by 36 farms in the Huntington and Charleston markets in 1935–36, L. F. Herrmann and G. A. Bowling (*West Virginia Sta. Bul. 281 (1937), pp. 27*).—This is the second study of the series previously noted (E. S. R., 75, p. 123). It is based on data for the year beginning July 1, 1935. Of the 36 farms studied, the milk from 15 was sold in Huntington and that from 21 was sold in Charleston. An analysis is made of the different items entering into the cost of production and the factors affecting the principal items. "In the Huntington herds, total costs per hundredweight of 4-percent milk, f. o. b. the farm, were $2.20. Feed costs per hundredweight averaged $1.14, or 52 percent of the total. Miscellaneous credits reduced the cost per hundredweight of milk to a net amount of $1.94. In the Charleston herds, total costs were $2.26 per hundredweight of which feed costs made up $1.32, or 58 percent. Miscellaneous credits reduced the net cost of production to $1.97 per hundredweight. The average production per cow was 5,336 lb. of 4-percent milk in Huntington herds and 5,734 in Charleston herds. Comparison of low- and high-cost herds showed that high costs were due to less than average production per cow; too heavy feeding of grain that was too high in protein in relation to the roughage fed; and high costs for use of buildings and for other items besides feed and labor. Producing ability of the cows kept, together with their management for high production, had so strong an influence on costs of production as to obscure the effect of size of herd."

Milk-distribution costs in West Virginia.—III, A study of the costs incurred by 67 producer-distributors in the Charleston, Huntington, and Parkersburg markets for a twelve-month period during 1935–36, L. F. Herrmann (*West Virginia Sta. Bul. 282 (1937), pp. 26, fig. 1*).—This is the third bulletin of the series previously noted (E. S. R., 75, p. 867). Data were obtained from 27 Charleston, 23 Huntington, and 17 Parkersburg producer-distributors and analyzed.

The cost of distribution ranged from $1.14 to $5.87 per 100 lb. of milk, averaging $1.94. Labor averaged 93 ct. per 100 lb., truck expenses 45 ct., depreciation 10, repairs 2, bottles and caps 8, supplies 9, taxes 1, bad debts 10, interest 8, and other expenses 8 ct. Producer-distributors selling an average of 69 gal. of milk-equivalent per day had an average cost of $1.68, while those selling only 21 gal. had an average cost of $2.84. With efficient use of labor, costs averaged $1.52; with inefficient use the cost averaged $2.63. The average costs increased by 16 ct. from the low-investment to the medium-investment group, and 77 ct. from the medium- to the high-investment group.

Crops and Markets, [July–August 1937], (*U. S. Dept. Agr., Crops and Markets, 14 (1937), Nos. 7, pp. 129–156, figs. 2; 8, pp. 157–180, figs. 2*).—Both numbers include the usual monthly and seasonal crop and livestock production and market reports. No. 8 also includes (1) tables showing average prices received by farmers for farm products, July 15, 1936 and 1937, by States and for the United States, with comparisons with earlier years and periods, and (2) a table showing the hog-corn ratios on the fifteenth of each month, January

1927–July 1937, and a chart showing the ratio from January 1916 to July 1937.

A graphic summary of farm machinery, facilities, roads, and expenditures (based largely on the census of 1930 and 1935), O. E. Baker (*U. S. Dept. Agr., Misc. Pub. 264 (1937), pp. II+35, figs. 63*).—This is one of the series of the publication previously described (E. S. R., 77, p. 117).

RURAL SOCIOLOGY

Population mobility in selected areas of rural Ohio, 1928–1935, C. E. Lively and F. Foott (*Ohio Sta. Bul. 582 (1937), pp. 53, figs. 7*).—The data of this bulletin were drawn from a survey of 2,554 rural households located in 10 rural townships and in 8 villages. The analysis shows that in the areas surveyed there was a net loss of population due to migration during the period from 1930 to 1935 except in the northeastern, urbanized section. Households with the greatest mobility were those normal family households composed of husband and wife, with or without children, in which the head of the household was under middle age. Relief families had 40 percent more moves and 100 percent more changes of occupation than nonrelief families. Adult children migrating from the parental home before 1929 were living at home in 1935 at the rate of 33 per 1,000 for males and 15 per 1,000 for females. They left cities at the rate of 93 per 1,000 who had migrated there. Females, children of village households, and children of relief households emigrated at rates higher than average. Of every 1,000 children who were 10 yr. of age or over in 1929 and living at home 654 were still living at home in 1935. Of the latter 48 percent of the males and 59 percent of the females were 21 yr. of age or over. Male heads of families were continuously employed in 82.0 percent of the cases. Of the others 13.7 percent were employed part of the time and 3.7 percent were not employed at any time. The median number of months of unemployment was 29.2.

The process of occupational change consisted largely of an attempt on the part of wage workers to avoid unemployment and to obtain an occupational status of greater economic security. In order to accomplish this some shifted toward agriculture. Many unable to do this swelled the ranks of the unemployed.

Immigration settlements and social organization in South Dakota, J. P. Johansen (*South Dakota Sta. Bul. 313 (1937), pp. 63, figs. 8*).—Foreign groups in South Dakota (E. S. R., 75, p. 872) "differ greatly in the development and strength of their social organization. . . . Social organization furnishes the channels in which the assimilation processes take place. It determines the extent to which the foreign group may retain its heritage and project its national cultural influence upon the native community. . . . A comprehensive movement toward unity and federation is taking place. . . . Immigration organizations such as lodges, mutual-aid societies, colonization agencies, newspapers, and higher educational institutions disappear with the passing of the immigrant generation."

The history of the various immigrant settlements in the State and their development is briefly summarized.

Occupations of sons and daughters of Mississippi cotton farmers, D. Dickins (*Mississippi Sta. Bul. 318 (1937), pp. 132, fig. 1*).—This bulletin presents data collected by personal interviews in 5 counties on the general occupational distribution of sons and daughters from 19 to 34 yr. of age; the relation of age, education, marital status, and residence to occupation; the relation of the characteristics and composition of the parental family to type of occupation; the

relation of socio-economic influences to type of occupation: farming, nonfarming, and part-time farming sons and daughters; the occupational situation of the handicapped, the widowed, and the divorced sons and daughters; and the desirable occupational situation. The questionnaires and schedules used are appended.

Characteristics of Arkansas rehabilitation clients, W. T. Wilson and W. H. Metzler (*Arkansas Sta. Bul. 348 (1937), pp. 48, figs. 8*).—Of the 21,000 applicants classified for rehabilitation 17 percent were rated the best prospects, 56 percent good, and 14 percent fair. Nine percent were disapproved for lack of promise and 4 percent because they should have been able to obtain private credit. Negroes constituted 26.5 percent of the rural population but only 7.6 percent of the rehabilitation clients. The average age of rehabilitation clients was 40 yr. as compared with a median of 49 for the heads of rural households throughout the Nation. Rehabilitation clients were most numerous in the Ozark Mountain districts in which from 15 to 25 percent of the rural families were included on the program. Only from 1 to 3 percent of the families in the Delta area were granted loans. All but 4.8 percent of the clients had been on the regular relief rolls, but the average time was slightly more than 4 mo. The average size of rehabilitation households was 5.4 members. They contained nearly twice as many children but only one-third as many old people as the average American family. The birth rate in the group in 1934 was about 3.5 times the national average. Three-fourths of the rehabilitation clients lived on upland farms in 1932. The clients had attended school an average of 5.6 yr. In general, rehabilitation clients were young farmers with large families who, during the years of drought and depression, had used up their resources to such an extent that they could no longer farm efficiently. While their incomes were low, they were not habitual dependents. They lacked food and clothing, but their basic needs were for livestock, farming equipment, and funds to discharge existing obligations.

A graphic summary of the relief situation in South Dakota (1930–1935), W. F. Kumlien (*South Dakota Sta. Bul. 310 (1937), pp. 63, figs. 52*).—One of the important factors leading to maladjustments in land use within the State has been the relatively large number of settlers coming from eastern and more humid States, where the prevailing agricultural pattern is for small farms and intensive cropping. Until 1909 the Government's policy of limiting homesteads to a quarter section unfortunately aided in establishing and perpetuating a unit too small for an extensive farming region.

The high prices of the World War gave an undue stimulus to crop production in the Great Plains region west of the hundredth meridian. The war period happened to coincide with a favorable rainfall cycle which, in its effect, misled thousands of ranchers into thinking that dry-farming with small units could compete profitably with the intensive farming regions. This led to the land boom of 1919, followed by a later collapse of farm prices.

During 1930 South Dakota took care of its own relief cases through local funds. In 1931, 1932, and the first half of 1933 the Red Cross and Reconstruction Finance Corporation contributed a total of 42.5 percent towards the total cost of relief, while the State contributed 57.5 percent. Since July 1933 Federal funds have constituted the bulk of relief moneys, although the various counties have done surprisingly well throughout the entire period in mainly taking care of their own unemployables.

Precipitation was below normal every year during the 1930–35 period, the most devastating droughts occurring in 1931, 1933, and 1934. In 1933 and

1934 crop failure was almost complete in over two-thirds of the State. Crop failure in the worst drought years was much less pronounced in the southeastern and extreme western portions of the State. In addition to a greater shortage of rainfall in central South Dakota, grasshopper infestation was most intense in that area.

Due to the drop in agricultural prices following the agricultural expansion of the boom war period, the credit structure of the State became so badly disrupted that South Dakota's resources were at a low ebb at the beginning of the current drought and depression cycle. Depleted resources were attested to prior to the 1930-35 period by the mounting ratio of indebtedness to farm value, by wholesale bank failures, mortgage foreclosures, tax delinquencies, seed loans, and other indexes.

As South Dakota is predominantly an agricultural State, agricultural distress is either directly or indirectly responsible for unemployment. Due to the absence of other industry, in years of crop failure there is little to which South Dakota citizens can turn for a livelihood.

Considering the period (1930-35) as a whole, relief distribution, with only a few exceptions, has followed a well-defined and consistent pattern. Relief in various parts of the State has varied in intensity, in proportion to their marginality or submarginality in precipitation and crop production, in normal times as well as during the depression. In the intensive relief areas the families most subject to relief have usually been those with the least income and reserves. Usually the smaller incomes are due to maladjustments in land use, such as operating too small a sized farm, using the wrong type of farming for a given area, or poor farm or home management.

The social consequences of the economic depression, W. Woytinsky (*Internatl. Labor Off., Genève, Studies and Rpts., Ser. C, No. 21 (1936), pp. XI+364, figs. 52*).—The composition and fluctuations of the national income in relation to the depression in a number of countries selected as typical and the incidence of the depression on employed population, farmers, craftsmen, traders, public officials, savings depositors, persons of independent means, and capitalists are discussed. The section on farmers discusses the agricultural depression, agricultural income, yields and consumption of agricultural products, labor problems, and indebtedness.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Conservation in the education program, W. H. Bristow and K. M. Cook (*U. S. Dept. Int., Off. Ed. Bul. 4 (1937), pp. V+78*).—"The purposes of this bulletin on 'conservation education' are, first, to provide school officials and others interested with information concerning progress so far made in introducing conservation into the school program, and, second, to stimulate further progress through a description of instructional practices which have been successfully followed in a number of school systems."

Elementary and secondary education in South Dakota, 1933–1934 and 1934–1935.—A preliminary report of the education committee (*Brookings: S. Dak. State Planning Bd., 1937, pp. [2]+VIII+165, figs. 64*).—This preliminary report was made "to give a general factual picture of our common, consolidated, and independent schools as a preliminary study and analysis necessary for sound planning and conservation of the social and economic resources in the State." Data are included as to types of institutions, enrollment, ability of communities to pay for public schools, expenditures, buildings and facilities, and school libraries.

FOODS—HUMAN NUTRITION

Food technology, S. C. Prescott and B. E. Proctor (*New York and London: McGraw-Hill Book Co., 1937, pp. IX+630, figs. 70*).—The fundamental principles involved in the various methods of food manufacture and treatment are emphasized in this volume, which is designed to serve as a basis for a broad and constructive treatment of the field of food technology. Food technology in the sense in which it is used by the authors comprises the economic application of the laws and processes of biology, physics, chemistry, and engineering in the preparation and preservation of food products. The book should prove of value to food manufacturers, nutritional directors, and those concerned with the official supervision and inspection of food supplies, as well as to teachers and students of food technology.

Elements of foods and nutrition, M. T. Dowd and A. Dent (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, pp. XIII+279, figs. [38]*).—In this textbook on the basic scientific principles of foods and nutrition for high school boys and girls, the importance of forming good food and health habits is stressed. The subject matter is presented in a very simple form, with exercises, questions, and a limited number of reference readings at the end of each chapter.

Experimental cookery, B. Lowe (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, 2. ed., pp. XI+600, figs. 75*).—In this revision of the volume noted previously (E. S. R., 68, p. 559), the arrangement of the subject matter and the laboratory outlines is not altered, but some new material and illustrations have been added. Discussions on the following subjects are the most important additions noted: The stereochemical forms, pyran and furan, of the sugars higher than the tetroses; the grading, stamping, and Federal inspection of meat; the homogenization of milk, sugar reactions with milk proteins, and the composition and processing of cheese; the application of the results of recent research on the whipping quality of egg whites; the milling process, the structure of wheat, and flour terminology; and new data on cake baking.

Facts, fads, and frauds in nutrition, H. S. Mitchell and G. M. Cook (*Massachusetts Sta. Bul. 342 (1937), pp. 31*).—This bulletin presents in brief and readable form information intended to serve as a guide to the consumer in evaluating the merits of the claims made in food advertisements. The material presented is a summarization of information, decisions, and criticisms by recognized authorities concerning nutritional and therapeutic claims in food advertising, as well as faulty conceptions and notions regarding foods and nutrition, and contains quotations from publications of the American Medical Association and the U. S. D. A. Food and Drug Administration. Vague health claims, reducing regimes, laxative foods, partially digested or predigested foods, mineral and vitamin claims, disease cures, and false therapeutic claims for food and for mineral or spring water are discussed. The modern food quack lecturer is described, and many of the common food legends are answered. The sources for obtaining scientific opinions on food fads and quackery are noted.

[**Nutrition studies by the Arizona Station**] (*Arizona Sta. Rpt. 1936, pp. 17, 63–68*).—Results are reported on the fluorine content of chilies, cucumbers, and summer squash; the effect of fluorine-containing diets on normal and parathyroidectomized rats; the vitamin A content of carrots; and a State-wide survey of the iodine content of the water supplies.

[**Nutrition studies by the Kansas Station**] (*Kansas Sta. Bien. Rpt. 1935–36, pp. 115–118*).—Included in this progress report are studies conducted by M. M. Kramer on the vitamin A content of selections of yellow corn, the vitamin C

content of bean sprouts, and the vitamin A and C content of the milk of dairy cows maintained under conditions practiced in Kansas, the utilization of calcium and phosphorus from various forms of milk and milk products, and the effect upon the animal body of varying the amount of vitamins in the diet.

A study of juiciness and flavor of standing and rolled beef rib roasts, A. M. Child and G. Esteros (*Jour. Home Econ., 29 (1937), No. 3, pp. 183–187*).—In this contribution from the Minnesota Experiment Station, meats obtained from experimental animals from the animal husbandry division of the station were allowed to ripen for 11 days at 2° C. and the right cuts of the seventh and eighth and the ninth and tenth ribs used for the standing roasts and the corresponding lefts for the rolled roasts. The constant temperature method of roasting in an electrically controlled oven at 149° C. (300° F.) to an interior temperature of 58° was followed, and after cooking the roasts were allowed to reach an internal temperature of from 61° to 64° and then cut in halves. From one half samples were taken for determinations of the quantity of juice with the pressometer (E. S. R., 72, p. 132), and from the other half samples were taken for scoring. The official record sheets of the cooperative meat investigations were used for recording the weights of the raw and cooked meat, evaporation, drippings, and total cooking losses and the official score card for judging, which was done by 63 persons.

Statistical analysis of the various data obtained indicated that the "Standing beef rib roasts had a larger quantity of juice than the corresponding rolled roasts." There was a slight tendency for the standing roasts to have a richer quality of juice. There was no consistent difference in flavor. The total losses, total cooking time, and the minutes required per pound were greater for rolled than for standing roasts.

Care of meat in the household refrigerator, L. J. Peet (*Iowa Sta. Res. Bul. 215 (1937), pp. 157–188, figs. 5*).—The object of the study was to determine the most desirable storage conditions for meat in ice and electric household refrigerators. Paired cuts of beef, pork, and lamb and corresponding portions of ham, bacon, sausage, dried beef, ground beef and pork, and ready-to-serve meats were stored unwrapped, wrapped in paraffin paper, parchment and brown papers, and in glass, aluminum, and enamelware covered containers for varying lengths of time in an ice refrigerator at from 45° to 52° F. and in an electric refrigerator at from 37° to 45°. Shrinkage losses were determined by weighings made at 24-, 48-, and 72-hr. periods, with once every 4–5 days for the ham and bacon samples. Samples of the steaks and chops were oven-broiled and compared for color, appearance, odor, and flavor, as were seasoned and unseasoned portions of ground beef and pork. Pairs of the roasts stored for from 24 to 120 hr. were oven-cooked to an internal temperature of 140° for the beef, 165° for the lamb, and 175° for the pork, weighed, and returned to the refrigerators. The meats were judged daily until signs of spoilage appeared.

The greatest loss in weight occurred when the meat was stored uncovered and the least when wrapped in paraffin paper or kept in a covered container. Steaks and chops stored for 48 hr. in covered containers at temperatures below 45° were juicy and had a fresh flavor. No spoilage was apparent in the cooked samples until after 72 hr., when those wrapped in paraffin paper and stored at 42° or below showed the least deterioration. Steaks frozen and stored in the freezing unit of the electric refrigerator were more palatable when covered or wrapped and when cooked without defrosting.

The roasts of beef, lamb, and pork behaved similarly under corresponding storage conditions, and up to 48 hr. the method of storage was immaterial. Unwrapped roasts and those in paraffin paper had a slightly old odor after 48 hr.

and the covered samples were disagreeable in odor and slimy after 72 hr. Wrapped and covered roasts in the ice refrigerator tended to have a slight growth of surface mold. Greater shrinkage resulted when the cooked roasts were cooled before being returned to the refrigerator. The wrapped and covered cooked roasts of lamb kept satisfactorily for only 72 hr., the beef for 5 or 6 days, and the pork for 12 days. It is concluded that cooked roasts may be stored satisfactorily for 2 or 3 days at temperatures of 48° or below when wrapped in paraffin paper or stored in perforated covered containers. For longer periods the meat should be left unwrapped or wrapped loosely in paraffin paper and kept at a temperature below 45°.

Hams stored unwrapped at temperatures below 45° were satisfactory after a 2-week period. For longer storage the glass container is preferred. Sausages in casings wrapped loosely in parchment paper kept well at temperatures below 45° for at least 7 to 8 days. Samples of seasoned ground sausage meat wrapped in parchment and in wax paper were the most desirable after 48 hr. Dried beef was satisfactory after storage at 42° for from 3 to 4 weeks in a glass container or in paraffin and parchment paper. Ready-to-serve meats were best when wrapped and stored not longer than from 24 to 48 hr.

Physical status of two hundred and nineteen Pueblo Indian children, E. C. Dunham, S. D. Aberle, L. Farquhar, and M. D'Amico (*Amer. Jour. Diseases Children, 53 (1937), No. 3, pp. 739–749, figs. 3*).—The nutritional status of children aged from 7 to 11 yr. was judged by the amount of subcutaneous fat, the musculature, and the color of the mucous membranes. Wasserman and tuberculin tests, blood counts, hemoglobin estimations, and roentgenographic examinations of the chests and abdomens were included. The diet of the children was poor in quality and quantity, and their eating habits were unsupervised and irregular.

The general nutritional condition was estimated as "good" in 17 percent, "fair" in 48, and "poor" in 34 percent of the children. Posture was rated as good in 6 percent, fair in 50, and poor in 44 percent. About 33 percent had enlarged tonsils or adenoids and 15 percent enlarged thyroids. Dental caries existed in 86 percent and alveolar disease in 12 percent. The red blood cell counts were below normal in 17 percent and the hemoglobin in 13 percent. Trachoma was present in 14 percent, syphilis in 2, infections of the respiratory tract in 16, and of the skin in 10 percent. By comparison it was found that these Pueblo Indian children were shorter and lighter in weight for their age than either white or Navaho Indian children of the same age and sex.

Metabolism of anesthetized rats, M. Kleiber and F. J. Saunders (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 377–380, fig. 1*).—In this contribution from the California Experiment Station at Davis experiments are reported which were undertaken to determine the feasibility of anesthetizing rats for metabolism studies as a means of reducing the variability of metabolic rate among different rats.

Sodium amytal in a 1-percent suspension was used as the anesthetic and was administered to fasting female rats from 65 to 163 g in weight by intraperitoneal and subcutaneous injection. The respiratory exchange was determined individually in closed respiration apparatus. The influence of differences in body size was eliminated by suitable calculations and the results for individual rats averaged for each half-hour period of the entire period of 6 hr. The intraperitoneal injection of the drug did not decrease the variability in the rate of oxygen consumption, and the subcutaneous injection decreased the variability to such an extent that average results of a given standard deviation of the mean could be obtained with approximately half as many anesthetized

rats as would be required with nontreated rats. It is considered doubtful, in view of other complicating factors, whether this decrease in variability justifies the application of anesthesia in respiration experiments.

The relation of glycine and serine to growth, R. H. McCoy and W. C. Rose (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 581–588, figs. 2*).—The results of a series of experiments on rats receiving synthetic diets containing the amino acid threonine but deficient in glycine and serine show that the latter amino acids are dispensable for growth purposes. The weight increases shown by the experimental animals were comparable with those of the control rats receiving similar rations supplemented with glycine and serine.

Effect of carbohydrate on certain factors in fatigue, F. W. Schultz and E. Blish (*Amer. Jour. Diseases Children, 53 (1937), No. 4, pp. 960–974, figs. 5*).—The changes in the acid-base balance and in the sugar content of the blood after exercise were studied in 16 children between the ages of 8 and 13 yr. The effects of exercise on a stationary bicycle-ergometer were observed when the subjects were in the fasting state and after the injection of various sugars.

An increase in fixed acid was shown by 14 subjects after 15 min. of exercise during fasting, with the normal children generally showing a better response than the asthenic children. The normal children showed a lower value for fixed acid at the peak, which tends to indicate a greater improvement in oxygen transport and, therefore, a quicker response for the delay of fatigue. When sugar was given just before exercise, the entrance of fixed acid was inhibited after 15 min. or at exhaustion in 6 children. Three of 4 children given sugar ½ or 1 hr. before exercise showed a more rapid effect on the depression of fixed acid than was seen when the sugar was given simultaneously with the exercise. The ability to store sugar improved with exercise. Training further increased the efficiency of the mechanism for glycogen storage and for oxygen transport. Lactose and sucrose had no inhibiting effect on the rise in the level for fixed acid during exercise. Dextrose was the most efficient of the sugars studied for alleviating the accumulation of lactic acid due to exercise. Levulose failed to give a uniform response.

A comparison of the antitryptic activity of egg white with its capacity to produce a characteristic nutritional disorder, H. T. Parsons (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 685–690*).—In continuation of the investigation at the Wisconsin Experiment Station of the nutritional disorder produced under certain conditions by egg white (E. S. R., 75, p. 889), the author, with the cooperation of E. Kelly, has tested the hypothesis of Cohn and White (E. S. R., 74, p. 437) that antitrypsin may be a factor in the etiology of the pellagra-like syndrome.

Crude concentrates of an antitrypsin, prepared by the method of Balls and Swenson (E. S. R., 73, p. 153), with slight modifications, from the commercially fermented dried egg white which had been shown to be highly active in producing the pellagra-like lesions in rats, showed no increase over the egg white in the capacity to produce the syndrome, but on the contrary permitted the healing of characteristic lesions when the diets containing the concentrates had a much higher content of antitrypsin than present in the physiologically injurious diets carrying egg white. It is concluded that the syndrome cannot be attributable to the antitryptic content of the substance.

The treatment of hypochromic anemia in college women, D. Duckles, L. Willis, and C. A. Elvehjem (*Jour. Amer. Dietet. Assoc., 12 (1937), No. 6, pp. 537–546, figs. 4*).—Comparative studies were made at the Wisconsin Experiment Station to demonstrate the effectiveness of iron, with and without copper, in the treatment of hypochromic anemia. The subjects chosen had shown two

or three successively low hemoglobin readings and averaged 11.4 g per 100 cc of blood. One group received 25 mg of iron daily in the form of ferric pyrophosphate and another group received in addition to the iron 1 mg of copper from copper sulfate, while the control group received no treatment. The Newcomer method was used for the hemoglobin determinations, the color of the cutaneous blood samples taken from the fingertip being compared with a carefully standardized disc in a Bausch and Lomb colorimeter.

The hemoglobin values for the 40 women receiving iron and copper ranged from 12.69 to 13.69 g, with an average of 13.23 g per 100 cc. Apparently no copper deficiency existed, since the 35 women receiving iron alone showed about the same increase in hemoglobin level, with an average value of 13.15 g and a range of from 12.85 to 13.49 g per 100 cc. The administration of 25 mg of iron daily, with and without copper, was sufficient to increase the hemoglobin from the hypochromic anemia level to within the normal range.

Vitamin content of foods, E. P. DANIEL and H. E. MUNSELL (*U. S. Dept. Agr., Misc. Pub. 275 (1937), pp. 176*).—In this publication quantitative data on the vitamin A, B, C, D, and G content of over 225 raw foods are given in concise tabular form, together with the ascorbic acid content of about 150 foods as determined by one or more titration methods. The chemical nature of each factor is briefly summarized, and the international units and standards of reference as adopted at the 1934 Conference of the League of Nations Committee on Biological Standardization are defined. Certain aspects of the human requirements for vitamins are discussed. An abridged table gives the vitamin content expressed as units per 100 g of 120 common foods. A list of references contains 771 citations.

The behavior of vitamins in frozen storage fruits and vegetables [trans. title], K. PAECH (*Ernährung, 2 (1937), No. 4, pp. 167–172*).—In this review of the literature, the author summarizes the various possibilities for destruction of vitamin C in fruits and vegetables preserved by frozen storage as (1) the breakdown of living cells during storage in the dark such as cold storage or in transportation, (2) the oxidation by atmospheric oxygen with the help of enzymes which are particularly active in brokendown cells, as in frozen and subsequently thawed vegetables or in bruised parts of the material, (3) truly chemical oxidation by atmospheric oxygen, particularly at high temperatures, and in neutral or alkaline medium, such as on long cooking, and (4) oxidation or destruction through chemical agents which may be used in food preservation such as metabisulfite.

Further studies concerning the formation of the B-vitamins in the digestive tract of the rat, N. B. GUERRANT, R. A. DUTCHER, and R. A. BROWN (*Jour. Nutr., 13 (1937), No. 3, pp. 305–315*).—In this extension of earlier studies at the Pennsylvania Experiment Station (E. S. R., 74, p. 423), the possibility that an appreciable amount of fat in the diet might affect carbohydrate digestion and change the nature of the flora of the lower intestinal tract to a condition more favorable to the synthesis of vitamin B was tested by incorporating 10 or 20 percent of hydrogenated cottonseed oil in the vitamin B complex-deficient diet containing sucrose as the source of carbohydrate. Except for a measurable decrease in the amount of food consumed and a slight increase in the amount of ether-insoluble fecal matter this addition was without effect. When starch autoclaved for 4 hr. at 15 lb. pressure served as the carbohydrate, there was a marked increase in growth rate, the percentage of ether-insoluble fecal matter was almost doubled, the number of fecal particles was trebled and their average weight reduced approximately one-fourth, and the reducing equivalent of the fecal matter was increased sevenfold. Further autoclaving of the starch for 8 and 12 hr. increased these values only slightly.

When the crust and crumb of bread were fed as the chief source of carbohydrate the growth responses were so great that a possible effect of the consumption of the feces was obscured. The supplementing value of the feces from animals receiving a diet containing corn flakes was quite definite, but not as marked as on the dextrinized cornstarch diet. The authors conclude that "those diets which, when fed to rats, result in relatively large percentages of fecal matter, having a low density and a high reducing equivalent, are conducive to the formation of substances in the digestive tract which are effective in supplementing a vitamin B complex-deficient diet."

Vitamin C studies in the rat and guinea pig, J. L. Svirbely (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 543–553*).—In order to investigate further the role of the small intestines in the synthesis of vitamin C by the rat, as suggested by Hopkins and Slater (E. S. R., 76, p. 134) and earlier work of the author (E. S. R., 76, p. 727), young rats were fed a ration of Dog Chow mixed with various substances, inorganic and organic, known to interfere with the normal metabolic activities of the liver and intestines. At the end of the test period the rats were killed by stunning 18–20 hr. after feeding, and various organs and tissues were analyzed for ascorbic acid as described in the earlier study.

The feeding of metallic salts, some of which poison the intestinal epithelium, did not prevent the synthesis of vitamin C in the rat. The failure of copper sulfate in amounts of 25 and 50 mg a day to prevent the synthesis is thought to suggest that "the body has a protective mechanism which prevents the catalytic oxidation of vitamin C with $CuSO_4$." Of the organic compounds tested, only the halogenated compounds such as bromobenzene or iodoacetic acid interfered with the synthesis of vitamin C.

In a study of the effect of a high sodium salt diet on the production of scurvy in guinea pigs, animals receiving the Sherman basal vitamin C-free diet and the same diet to which a mixture of sodium chloride and sodium citrate had been added showed no differences in survival periods or severity of symptoms. "Vitamin C is the limiting factor in preventing scurvy and, in those animals which are susceptible to this deficiency disease, is necessary for the utilization of the cortical hormone or the salt mechanism apparently controlled by cortin."

The relationship of vitamin C to glucose tolerance in the guinea pig, A. Sigal and C. G. King (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 489–492*).—Guinea pigs weighing about 300 g were fed a vitamin C-free diet supplemented with cod-liver oil and a solution of crystalline vitamin C furnishing 2 mg of the vitamin a day until they had reached weights of approximately 600 g and were then depleted of their vitamin C reserves for 20 days, during which time glucose tolerance tests were made on the tenth, fifteenth, and twentieth days. Vitamin C was then given in doses of 10 mg daily, with glucose tolerance tests on the tenth and fifteenth days.

During the depletion period there was a successive rise in the fasting blood sugar level and a distinctly lowered glucose tolerance. On readministration of the vitamin C the values returned to normal within 15 days.

In discussing the data the authors note that they have not obtained comparable results in similar studies with deficiency of the thermolabile factors of the vitamin B group. It is considered of possible significance that vitamin C is normally present in high concentration in the tissues which control glucose utilization.

Some factors influencing ascorbic-acid (vitamin-C) content of apples, E. N. Todhunter (*Food Res., 1 (1936), No. 5, pp. 435–442*).—In continuation of studies at the Washington Experiment Station (E. S. R., 76, p. 566), the author has made a further study of the influence of duration and temperature of storage on the vitamin C content of apples, using the Delicious and Richared

varieties; has extended studies of varietal differences to Richared, Golden Delicious, Yellow Newtown, and Rome Beauty varieties; and has compared the vitamin C content of whole apples with that of apple flesh. Guinea pig feeding tests were used throughout, with dye titrations as a check on four varieties.

Apples of the Delicious variety stored for 12 mo. at 7.2° C. (45° F.) failed to give complete protection against scurvy when fed at a level of 40 g daily, whereas the protective dose of the fresh apple of the same variety has been established by Batchelder (E. S. R., 73, p. 136) as 25 mg. There was thus a loss of about 50 percent of the original vitamin during the storage. The pared apples contained only from one-half to three-fourths as much of the vitamin as the same weight of the unpared fruit.

The results obtained by the dye-titration method were in fair agreement with those obtained by the animal feeding experiments on the whole apple but much lower on the apple flesh. It is suggested that the difference may be due to the fact that the apple flesh extracts were titrated directly and the extracts of the whole apple after treatment with mercuric acetate and hydrogen sulfide.

The alleged presence of dehydroascorbic acid in blood, A. E. Kellie and S. S. Zilva (*Biochem. Jour., 30 (1936), No. 3, pp. 361–368, figs. 2*).—Further evidence is given in support of the authors' assertion that "blood with its erythrocytes intact is incapable of dehydrogenating ascorbic acid in vivo and storing it in quantities capable of being detected by the existing methods, and that there is a tendency of the animal ogranism to keep the vitamin in a reduced stage."

Vitamin C metabolism in the new-born, W. Neuweiler (*Ztschr. Vitaminforsch., 6 (1937), No. 1, pp. 75–82, figs. 2; Fr., Eng. abs., p. 82*).—"Experiments on the excretion and the saturation with vitamin C were conducted on infants 9 to 10 days old. A marked difference was to be seen, according to whether the children had received much or little vitamin C (fed on breast milk or artificially). The vitamin C requirements of the suckling are relatively high, 6 mg of ascorbic acid per kilogram per day. Synthesis of vitamin C does not take place in the suckling. An adequate supply of vitamin C is of great importance for the suckling."

The vitamin C requirements of old people [trans. title], J. Gander and W. Niederberger (*München. Med. Wchnschr., 83 (1936), No. 2, pp. 1386–1389, illus.*).—Fourteen institution inmates ranging in age from 56 to 95 yr. were given 200 mg of Redoxon daily until saturation had been reached, as shown by a sudden and marked increase in ascorbic acid excretion in the urine, tested by the Jezler and Niederberger rapid method with 12-hour collection (see p. 7).

Although the diet of the institution was considered good, great pains being taken to supply plenty of fruits and vegetables, the subjects were all in a state of vitamin C undersaturation, for after 4 days there was no significant increase in excretion. The dosage was then increased to 400 mg daily. The total dosage required before saturation ranged from 1,200 to 3,400 mg. These findings were thought to indicate a greater need for vitamin C by old people and a greater need in sickness than in health.

In other series of saturation tests, 75 in all, of people of different ages and state of health, the results were arranged according to the amount of ascorbic acid required before saturation. All of the subjects requiring less than 800 mg for saturation were well, while there were only a few scattered cases of apparently well subjects requiring more. A study of the general condition of the subjects led to the conclusion that if from 700 to 1,200 mg is required for saturation, disturbance in the living part of the teeth, especially

the odontoblasts, is likely to be present. A saturation dose of from 1,200 to 2,200 mg signifies lowered vitality and disturbances in the blood picture; from 2,200 to 3,300 increased susceptibility to infection, loss in weight, and appetite; and 3,300 and over hemorrhagic diathesis and symptoms of scurvy.

The old people studied showed the various symptoms of those requiring a saturation dose of over 1,200 mg. To determine the requirements for vitamin C subjects of varying ages were given 450-mg tablets of Redoxon daily for from 2 to 3 weeks or until saturation and then were given small daily doses of from 25 to 75 mg. Observations of the daily excretion from October to March led to the conclusion that a daily dose of from 25 to 32 mg was sufficient for younger people and 50 mg for old people, with larger doses in infection. It is pointed out that no harm can come from large doses of vitamin C. In most of the older subjects an increased ability to work was an outcome of increased consumption of vitamin C. The observations are thought to indicate that vitamin C acts as a physiological and body regulating stimulant and to suggest that vitamin C metabolism may be an index of the state of the organism as a whole.

Vitamin C deficiency in tuberculosis [trans. title], F. HASSELBACH (*Deut. Med. Wchnschr.*, *62* (*1936*), *No. 23*, *pp. 924–928*, *figs. 3*).—The degree of vitamin C deficiency was noted in 34 patients with tuberculosis by determining the amount of ascorbic acid excreted in the urine according to Tillmans' method (E. S. R., 69, p. 7) following a tolerance test of 0.1 g Redoxon injected intravenously. Preliminary work indicated that 0.1 g of ascorbic acid injected intravenously reached a high point in urinary excretion in 2 hr., while 0.1 g of ascorbic acid injected subcutaneously reached a high point in 3 hr. and 0.2 g per os in 4 hr. after administration. The tolerance dose of 0.1 g of ascorbic acid, therefore, was given intravenously throughout the investigation. A division was made of the excretion curves plotted to show the milligrams percent of ascorbic acid excreted in 24 hr. following the tolerance test. A flat curve was one which reached a high point of 2.9 mg percent of excreted ascorbic acid, a negative middle curve reached a high point of from 3 to 4 mg percent, a positive middle curve from 4.1 to 5.9 mg percent, and a high curve 6 or more milligrams percent. A flat curve showed definitely a vitamin C deficiency, and a high curve showed a definite saturated condition of the organism. The results showed that a vitamin C deficiency existed in tuberculous patients with high fevers and elastic fibers in their sputum. The deficiency was overcome by increased ascorbic acid intake, which also gave other beneficial therapeutic results.

Prophylaxis of rickets in infants with irradiated evaporated milk, L. T. DAVIDSON, K. K. MERRITT, and S. S. CHIPMAN (*Amer. Jour. Diseases Children*, *53* (*1937*), *No. 1*, *I*, *pp. 1–21*, *figs. 3*).—In continuation of previous studies (E. S. R., 76, p. 728), the authors determined the degree of protection from rickets during the first 6 mo. of life in 18 premature and 15 full term infants receiving irradiated evaporated milk containing approximately 135 U. S. P. units per quart (1:1 dilution with water).

Ten of the premature and 9 of the full term infants received only irradiated evaporated milk from birth, while the others received some breast milk during the first few weeks of life. Orange juice was given at 1 mo. of age, cereal at the fourth to the fifth month, and vegetables at the fifth to the sixth month. The premature infants received iron and ammonium citrates. Sun baths were not given. The same criteria for the presence of rickets were applied as were used for the groups studied previously.

None of the 18 premature infants was entirely free from rickets when judged by roentgenograms, 6 showing slight, 9 moderate, and 3 marked rickets. Of the

15 full term infants 4 were free from roentgenographic signs of rickets, 1 showed moderate rickets, and the other 11 slight rickets which healed spontaneously by the fifth or sixth month. When the results were compared with those of the previous study in which the test material was metabolized vitamin D milk containing 432 U. S. P. units per quart, the irradiated evaporated milk was shown to be considerably less efficacious for the protection of the premature infant against rickets, due to the smaller concentration of vitamin D units acquired in the course of its production.

Phosphorus components in the blood of normal and rachitic infants, H. Bakwin, O. Bodansky, and R. Turner (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 365–368*).—A series of values for the phosphorus content of the blood, fractionated by a combination of acid and phosphatase hydrolysis, was determined for groups of normal and rachitic children. The acid-soluble phosphorus of the blood, which is made up of decreases in the inorganic phosphate, the readily acid-hydrolyzable phosphorus, and the fraction not hydrolyzable by bone phosphatase, was reduced in infants with rickets. The acid-insoluble phosphorus remained unchanged.

TEXTILES AND CLOTHING

A study of factors affecting the service qualities of certain textile fabrics (*Kansas Sta. Bien. Rpt. 1935–36, pp. 118, 119*).—Included in this progress report (E. S. R., 73, p. 141) are studies by E. Bruner, K. Hess, and A. Latzke on the effect of light of different wave lengths on service qualities of unweighted and weighted silks and the service qualities of fabrics as affected by laundering.

Analysis of some staple cotton materials used extensively for children's clothing, O. Smenner (*Arkansas Sta. Bul. 350 (1937), pp. 38, figs. 11*).—The relationship between cost and wearing quality was studied in six samples of nainsook varying from 11 to 50 ct. per yard, seven of broadcloth from 11 to 65 ct., and two of suiting costing 25 and 29 ct. per yard, respectively, by means of physical tests, microscopic observations, and other visual and hand tests. The physical characteristics studied in both the warp and the filling threads were thread count per inch, thickness of the fabric, weight per square yard, and the twist, crimp, and size of the yarn. The tensile and bursting strength, elongation under tension, and the tear resistance of the fabrics were determined. The following are some of the conclusions noted:

While the most expensive fabrics did not have the greatest tearing and bursting strength, they were lighter in weight, thinner in texture, smoother in finish, more even in yarn and weave, and showed more nearly balanced fabric elongation in the warp and the filling. The low-priced fabrics showed excessive stretching in the filling threads. A relationship was demonstrated between the price of the fabric and the thread count in the warp, but not the number of filling threads. The crimp in the warp was positively correlated with higher warp thread count, increased strength, and elongation in the fabric. The number of warp threads per inch decreased as the amount of crimp in the filling increased. As the number of filling threads per inch increased the warp and filling yarns showed more twist. Regardless of the number of twists per inch, the coarsest yarns had the highest tensile strength. The breaking strength of the fabrics showed a negative correlation with the thread count in the filling, but no correlation with the thread count in the warp.

HOME MANAGEMENT AND EQUIPMENT

Standards for working-surface heights and other space units of the dwelling, M. Wilson, E. H. Roberts, and R. Thayer (*Oregon Sta. Bul. 348*

(1937), pp. 38, pls. 2, figs. 8; Washington Sta. Bul. 345 (1937), pp. 38, pls. 2, figs. 8).—The purpose of this cooperative study was to obtain information for use in setting up standards for the dimensions of those parts of a house and its equipment used mainly by women. Body measurements and preferred activity heights of 312 Oregon and 250 Washington women were obtained by a survey analysis and formed the basis for the selection of the dimensions to be included in the study. The following measurements were studied: Optimum height of the kitchen sink, work tables, ironing board, and sewing table for the standing worker and of the kitchen planning desk, table, and ironing board for the seated worker, optimum height and width of the work chair and stool, maximum heights of shelves, knobs, hooks, closet rod, and drawer in work table, minimum width of work table, and minimum toe space at base of cabinet, minimum distance between upper and lower cabinets, maximum distance between top of table or desk and bottom of "apron," and maximum height of base of lower pane of window permitting worker to see her own yard while standing and seated. Posture tests were made on women washing dishes with pan in the bottom of the sink, and using a rotary beater, rolling pin, hand iron, and a dress pattern. Other data recorded include size of family and number of years of housekeeping experience, weight, use of eyeglasses at work, and height of working surfaces now used in the home.

A shallow sink with a narrow front rim placed so that the floor is 32½ in. above the room floor, with the counters set at 32 in., was preferred by the average homemaker. The optimum height for an ironing board is 32½ in., a cutting table 35½ in. for the standing worker, a kitchen planning desk 25 in., and a sewing table for use while seated 24 in. The work chair should be of a height that permits the occupant's feet to rest on the floor, with no pressure under the knees. The ironing board should be adjustable for use either with a chair or a stool. The stool should have a footrest and both should be adjustable as to height. The average cooperator chose a sink 3½ in. higher than that of the one in her own home. The authors suggest that the majority of cooperators would be well served by equipment planned for the average cooperator.

A comparison of cooking equipment for the farm home (*Kansas Sta. Bien. Rpt. 1935–36, pp. 119, 120*).—This progress report (E. S. R., 73, p. 142) includes studies by M. F. Taylor of the efficiencies and temperature distribution of heat with regard to star-shaped giant burners and in direct heated ovens.

The utilization of heat from electric surface units by certain cooking utensils, L. J. Peet and L. O. MacDonald (*Iowa Sta. Res. Bul. 212 (1937), pp. 57–88, figs. 15*).—The purpose of this investigation was to determine the temperature distribution from 10 different types of units over the surface of a cooking utensil and to study the variation in the boiling time and the variations in typical short- and long-time cooking processes, using utensils of aluminum, enamelware, and copper. The kilowatt-hour consumption when boiling water in aluminum and enamelware teakettles and in stewpans of equal capacity was also determined. All utensils were of medium weight, with straight sides, flat bottoms, tight-fitting lids, and had an approximate capacity of 2 qt. The units were of the incased, embedded, open and enclosed labyrinth, and reflector types. The following are some of the conclusions noted:

The distribution of temperature over the surface of an electric unit is fairly uniform and is only slightly lower at the outer edge. For heating water and for cooking small potatoes and navy beans, typical short- and long-time cooking processes, respectively, the three types of utensils were practically equal in efficiency. The cooking processes when started on cold units were completed in the shortest time on the incased units, while the open units required slightly

longer and the enclosed labyrinth, embedded, and cone reflector units the longest time. When preheated units were used the incased required the least time, the open, embedded, and enclosed labyrinth slightly longer, and the cone reflector type considerably longer time. Water heated in teakettles and stewpans of the same material and capacity required approximately the same time. The materal of the pan has comparatively little effect on the cooking efficiency. The aluminum pan with a black-bottom finish tended to show a slightly increased efficiency, but there was no significant difference between the enamelware black-bottom and natural finish pans.

Starting baked products in cold versus preheated ovens, L. J. Peet and B. Lowe (*Iowa Sta. Res. Bul. 213 (1937), pp. 89–124, figs. 3*).—The ovens of two gas, one kerosene, and three electric ranges were used in a comparative study in which plain and angel cakes, baking powder biscuits, yeast rolls, and cream puffs were baked in a preheated oven and started in a cold oven. Records were kept of the cooking period and fuel consumption of representative baking operations. All ingredients except those for cream puffs and yeast rolls were incubated at a constant temperature of 25°–26° C. The procedures were standardized and skills acquired during preliminary tests. At least five judges scored the cream puffs for appearance, cavity, and dryness, and the other baked products for texture, velvetiness, moistness, volume, appearance, and eating quality. Volume and tenderness were also determined mechanically. The following are some of the conclusions noted:

The cakes baked in preheated ovens, regardless of the type of range, were superior to those started in cold ovens. Baking powder biscuits baked in preheated electric ovens were preferable, but in the gas and kerosene ovens the products were equally desirable regardless of the method of baking or the type of range. With the exception of one electric oven which heated too slowly, the cream puffs baked equally successfully from a cold and a preheated start. The differences in fuel consumption in the two methods of baking were considered practically negligible, as were the differences in time required in the gas and kerosene ranges. However, there was a saving of time when foods were baked in the preheated ovens of the electric ranges.

Vacuum-pressure relationships in glass canning jars, C. R. Fellers, A. S. Levine, and W. A. Maclinn (*Massachusetts Sta. Bul. 341 (1937), pp. 20, figs. 9*).—The object of this bulletin is to establish the safety and efficiency of the "fully sealed" or Massachusetts method in the preservation of canned foods. Data are presented on the nature and development of internal pressures and vacuums in glass containers during thermal treatment, as determined by the method previously described (E. S. R., 76, p. 443). The results of a cooperative canning experiment are given in which home canners in western Massachusetts used more than 16,500 glass jars with new rubbers to pack 50 different products, the processing being done with the wire bail tightened so that all jars were fully sealed.

In water-bath processing negligible pressure was developed in the partially sealed jars, while the fully sealed jars developed from 2 to 6 lb. pressure which they withstood without bursting. In pressure processing the same amount of pressure was developed in the partially and fully sealed jars, with the latter requiring a longer time to attain it. Practically no difference was noted in heat penetration into jars of water either partially or fully sealed. The temperature of filling, volume of headspace, and condition of seal before processing had no effect on the amount of vacuum formed in the jars after packing. The vacuums present in sealed jars were high.

The practicability of the fully sealed method was demonstrated in the survey, since the cooperative canners reported no noticeable loss of liquid in 85.5 per-

cent, slight loss in 10.4, moderate loss in 2.2, and marked loss in only 0.6 percent, with the percentage of breakage in water-bath and pressure-cooked processing being about the same, namely, 1 percent. Laboratory tests confirmed these results by showing smaller vent losses in fully sealed jars, a fact which is of practical importance because loss of jar liquid results in an actual food loss, as well as an unattractive appearance and also increases the possibility of later spoilage. The fully sealed method of processing is recommended as a distinct improvement over the partially sealed method as formerly advocated.

A critical study of various types of detergents and disinfectants for use in dishwashing, W. L. Mallmann (*Amer. Jour. Pub. Health, 27 (1937), No. 5, pp. 464–470; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 1, p. 52*).—Bacteriologic examinations were made on samples of the glass and silverware in 22 restaurants before and after an educational program on methods of obtaining clean sanitary utensils. In the first survey an average bacterial count of from 17,000 to 100,000 per utensil was reported for 15 restaurants and from 8 to 8,000 for the remainder as compared with from 0 to 56 per utensil in all but 1 restaurant reported in the second survey.

Data are also given on the results of a study of detergents and sanitizing agents made on utensils used in four college-operated boarding clubs and one restaurant. The method described in a previous study (E. S. R., 74, p. 876) was followed in introducing cultures of *Staphylococcus aureus* and determining by plate count the number of organisms surviving after different times of exposure with three detergents and with the water in the dishwasher at different temperatures. It is concluded that the addition of sodium hexametaphosphate to detergent mixtures aids in the removal of bacteria. Wash water at a temperature of a least 140° F. and rinse water at not less than 170° are deemed most satisfactory and should be used in preference to chemical disinfection. In the absence of hot water chlorine sterilizers may be used. Bacteriological examinations should be made routinely on glass and silverware used in public eating places.

MISCELLANEOUS

Progressive agriculture: Forty-seventh Annual Report [of Arizona Station], 1936, R. S. Hawkins (*Arizona Sta. Rpt. 1936, pp. 94, figs. 15*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

[Biennial Report of Kansas Station, 1935–36], L. E. Call et al. (*Kansas Sta. Bien. Rpt. 1935–36, pp. 144, figs. 3*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Science in New Hampshire agriculture: Annual report of director of New Hampshire Agricultural Experiment Station for the year 1936, J. C. Kendall (*New Hampshire Sta. Bul. 296 (1937), pp. 36*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual summary of publications (*Utah Sta. Circ. 109 (1937), pp. [4]*).—Abstracts of Bulletins 272–277 and Circular 108 are given, with lists of reprints and leaflets.

A survey of current bibliographies on agriculture and allied subjects, A. Brizi (*Aperçu des bibliographies courantes concernant l'agriculture et les sciences connexes. Roma: Internatl. Inst. Agr., 1937, pp. [5]+84*).—This annotated list, presented in both English and French, is based on material received by the library of the International Institute of Agriculture. It is arranged by countries and includes abstract journals as well as bibliographies and similar material. An alphabetical title index and a subject index are appended.

NOTES

California University and Station.—An additional tract of 10 acres has been allocated to the division of subtropical horticulture on the Los Angeles campus. This land is being leveled, placed under irrigation, and planted for the purpose of supplementing the present collection orchard and as a teaching and research unit.

The College of Agriculture has received as a gift approximately 110 acres of the Wolfskill ranch at Winters. This is 11 miles from its northern branch at Davis and in the heart of the most valuable early fruit section. The tract is being equipped for the experimental work in pomology and allied divisions.

Dr. Carl L. Alsberg has been appointed to succeed H. R. Tolley, resigned, as director of the Giannini Foundation of Agricultural Economics in the College of Agriculture.

New York State Station.—P. J. Parrott, vice director since 1928, has been appointed director effective on the retirement of Director U. P. Hedrick (E. S. R., 77, p. 578) on January 15. Dr. R. F. Suit has been appointed associate in research (plant pathology).

Wisconsin University and Station.—Edward R. Jones, associated with the institution since his graduation in 1905 and head of the department of agricultural engineering since 1918, died October 22, 1937, aged 55 years. He was a pioneer in farm land drainage projects and a leader in soil erosion control. F. W. Duffee has been appointed to succeed him.

Association of Official Agricultural Chemists.—The fifty-third annual meeting of this association was held in Washington, D. C., November 1–3, 1937, with an attendance of approximately 400. The address of the president, C. C. McDonnell, dealt with The Insect Menace and the Role of Chemistry in Combating It, stating that organized investigation began about 1890, largely as a result of the passage of the Hatch Act. The Seventh Wiley Memorial Address was given by C. A. Browne under the title A Few Unsolved Problems of Agricultural Chemistry. In this Dr. Browne gave special attention to problems visualized and studied by Dr. Wiley, and stressed the need for cooperation in chemistry and related fields in such complex projects as those of the role of the trace elements which are now demanding attention.

Officers for the ensuing year include H. R. Kraybill as president; W. S. Frisbie as vice president; W. W. Skinner, U. S. D. A. Bureau of Chemistry and Soils, secretary-treasurer; and L. B. Broughton, J. W. Sale, G. G. Frary, and C. C. McDonnell as the executive committee.

Association of American Feed Control Officials, Inc.—The twenty-ninth convention of this association was held in Washington, D. C., November 4 and 5, 1937, with a registration of 125 and representatives of 29 States and the District of Columbia. The address of the president, L. S. Walker, entitled Some Observations on Uniformity, discussed the need for greater uniformity in the reporting of results of control work, the application of tolerances, and the disposition of fees. A considerable number of new definitions were formulated and adopted.

The vice president of the association, G. H. Marsh, was elected president, with L. M. Jeffers becoming vice president and C. F. Ladd a member of the executive committee. Reelection followed of L. E. Bopst, College Park, Md., as secretary-treasurer, while H. H. Hanson continued as chairman of the executive committee.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 4, the following section officers were elected at the Washington meeting, November 14–17, 1937: Agriculture, William Peterson of Utah, chairman, H. H. Kildee of Iowa, vice chairman, and S. W. Fletcher of Pennsylvania, secretary; engineering, M. L. Enger of Illinois, chairman, and G. W. Case of New Hampshire, secretary; and home economics, Statie E. Erikson of Kentucky, chairman, and Lita Bane of Illinois, secretary. Within the section of agriculture, the subsection of experiment station work elected C. L. Christensen of Wisconsin, chairman, and C. McKee of Montana, secretary; the subsection of extension work, L. R. Simons of New York, chairman, and F. W. Peck of Minnesota, secretary; and the subsection of resident teaching, P. W. Chapman of Georgia, chairman, and J. F. Cunningham of Ohio, secretary.

Although some reappointments of committee members whose terms had expired were made, the general policy was that of a change of personnel. On the committee on college organization and policy, W. E. Clark of Nevada was reappointed, and F. D. Farrell of Kansas succeeded R. S. Shaw of Michigan. On instruction in agriculture, H. H. Kildee of Iowa and V. C. Freeman of Indiana were appointed vice W. C. Coffey of Minnesota and H. P. Baker of Massachusetts; on instruction in engineering, R. P. Davis of West Virginia and P. H. Hammond of Pennsylvania, vice A. G. Crane of Wyoming and R. J. Sackett of Pennsylvania; on instruction in home economics, Pearl S. Green of Maine and Florence Harrison of Washington, vice Margaret S. Fedde of Nebraska and Genevieve Fisher of Iowa, with Lita Bane of Illinois becoming chairman; on experiment station organization and policy, H. W. Mumford of Illinois (reappointment), Edmund Secrest of Ohio, and Jessie E. Richardson of Montana, vice F. D. Fromme of West Virginia and Marie Dye of Michigan; on extension organization and policy, J. C. Taylor of Montana, C. E. Brehm of Tennessee, and Venia M. Keller of Maryland, vice C. W. Creel of Nevada, I. O. Schaub of North Carolina, and Annette T. Herr of Massachusetts, with W. H. Brokaw of Nebraska becoming chairman; on military organization and policy, G. W. Rightmire of Ohio and A. C. Willard of Illinois, vice C. W. Pugsley of South Dakota and R. G. Bressler of Rhode Island; on engineering experiment stations, E. B. Norris of Virginia (reappointment); on graduate work, E. M. Freeman of Minnesota, chairman, vice W. J. Robbins of Missouri; on radio, H. J. C. Umberger of Kansas (reappointment) and A. G. Crane of Wyoming, vice R. M. Fife of New Mexico; on land-grant institutions for Negroes, L. N. Duncan, chairman, vice J. D. Hoskins of Tennessee; on training for Government service, L. M. Short of Minnesota, vice W. M. Anderson of Minnesota, and C. R. Ball of Washington, D. C. (additional member); on rural youth, H. C. Ramsower of Ohio and F. E. Balmer of Oregon, vice R. K. Bliss of Iowa and F. L. Ballard of Oregon. V. R. Gardner of Michigan and C. E. Ladd of New York were reappointed to the joint committees on projects and correlation of research and publication of research, respectively. The U. S. Department of Agriculture representatives on the committees not previously noted were continued unchanged except for the addition to the committee on relationships of R. M. Evans, C. W. Warburton, T. H. MacDonald, W. A. Jump, J. T. Jardine, and Reuben Brigham. The committee on proper rating of professional schools was discontinued.

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RESEARCH AT THE 1937 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The major emphasis at the 1937 convention of the association, as pointed out in these columns last month, was inevitably commemorative and retrospective. The research program was in keeping with this general attitude, sharing in the tributes to Washington, Jefferson, and Lincoln and to the acts of 1862 establishing the Federal Department of Agriculture and the land-grant institutions, and presenting as its distinctive contribution a series of papers dealing with the Hatch Act of 1887. Questions of the present day, however, were not neglected, the principal subjects to receive attention being the status of interstate cooperation in agricultural and home economics research, the opportunities for research in farm woodlands, and the possibilities of increased cooperation in summarizing and evaluating available information on important agricultural problems.

The tributes to Washington, Jefferson, and Lincoln brought out the fact, not always appreciated, that this notable trio made a substantial contribution to the cause of agricultural experimentation. Washington, as President Franklin D. Roosevelt and others made clear, exemplified the spirit of scientific research and carried on at Mount Vernon carefully planned tests of such practices as soil improvement and erosion control, crop diversification, and the use of improved farm machinery. At Monticello Jefferson, in the words of Secretary Wallace, "evidently got his greatest pleasure out of agricultural experimenting. He tried to prevent soil erosion by plowing around the slope instead of up and down the slope. He applied the science of physics to the problem of working out the kind of a moldboard to a plow which would meet the least resistance. He invented a seed drill and experimented with various types of rotations. That a private individual with such slender resources should be able to do such sound pioneering in agricultural experimental work, along with his other activities, is one of the *miracles of American history.*" As for Lincoln, his advocacy in 1861 of a Federal bureau or department for agriculture, "confessedly the largest interest in the Nation," and his signing of not only the act carrying this project into effect but the original Morrill Act demonstrated his courage in disregarding sectional and other opposition to Federal aid to agriculture and his

sympathy with measures designed for its encouragement and development.

In addition to many references to research in addresses of general reminiscence, such as those of Director J. L. Hills of Vermont and former Directors Eugene Davenport of Illinois and H. J. Patterson of Maryland, the semicentennial of the Hatch Act was specifically recognized in the joint anniversary celebration in an address by Director F. B. Mumford of Missouri on its sponsor, Col. W. H. Hatch. Director Mumford emphasized the fact that Colonel Hatch was not only the author and for years the chief advocate of this legislation but the outstanding spokesman of his time for agriculture and the proponent during his official career of 16 years as Congressman from Missouri of no less than 200 bills dealing with agricultural problems. Concerning the Hatch Act itself, Director Mumford said that its passage "must be regarded as the beginning of a new policy relating particularly to the appropriation of Federal funds to the States for the solution of agricultural problems by means of scientific research. In the light of 50 years of history, the inauguration of this policy must be recognized as one of the most benign and generally effective Federal policies of our times."

In the experiment station subsection, the Hatch Act and its results formed the theme of the initial session. Director S. B. Doten of Nevada recounted in anecdotal and reminiscent vein some high lights of the 50 years of experience since its enactment, and Director S. W. Fletcher of Pennsylvania presented a comprehensive and painstakingly evaluated review of the major research achievements. An appraisal of the policies and procedures under the act from the standpoint of efficiency in administering productive research work was made by Mr. R. W. Trullinger of the Office of Experiment Stations. In this paper he discussed the history and underlying philosophy of the act and its supplementary legislation, concluding that from their direct or implied provisions there have been evolved the following: "(1) Provision of a standardized pattern and definition for the agricultural experiment stations based upon long-established and generally accepted procedure; (2) establishment of the scientific identity and status of the agricultural experiment stations; (3) specification of the purpose, functions, and obligations of the agricultural experiment stations with the systematic manipulation of the natural and social sciences in the prosecution of agricultural research as the keynote and objective; (4) justification for the general adoption of the organized specific project as the tangible but flexible basic unit in the administration of research; (5) provision for and establishment of the basic principles and practice of cooperation within individual agricultural experiment stations, between agri-

cultural experiment stations, and between the stations and the Department of Agriculture, and for the coordination of their facilities and research."

Turning from memories of the past to problems of the present, the subsection devoted its second session to interstate cooperation in agriculture and home economics research. Director W. L. Slate of Connecticut presented an impressive summary of actual accomplishments in this field, and Directors M. J. Funchess of Alabama, W. A. Schoenfeld of Oregon, and D. T. Gray of Arkansas outlined opportunities for more such cooperation in the future. Particularly helpful and clarifying was a discussion by Director L. E. Call of Kansas of limitations to such cooperation. Replies received by him from 43 States to a questionnaire on the subject revealed 7 outstanding handicaps—geographical isolation, inability of workers to confer frequently, cost, conflict with home obligations, lack of coordinating leadership, institutional pride and professional jealousy, and problems of personal relationships. Many of these factors are proving difficult to surmount, but none appeared to be insurmountable. "Personal problems," he found, "seem the most serious. Fortunately, excessive individualism appears gradually to be giving way to group consciousness as workers have an opportunity to work together and to appreciate the advantage that accrues to them personally from a cooperative attack on a problem. Institutional pride and professional jealousy are giving way to pride in the accomplishment of the group as a whole and an increasing realization that the interest of every single individual in any research organization is dependent, in part at least, upon the progress made by the institution and the group of institutions as a whole. . . . Running through nearly all the replies was the thought expressed directly or indirectly that the problems of today that the stations are being asked to solve are such as require cooperative attack for their solution, that many limitations upon this mode of attack are being overcome, and that nothing will prevent an increase in the future of interstate cooperation in research in agriculture and home economics."

The opportunity for research in farm woodlands was set forth by Director Edmund Secrest of Ohio, who visualized among other aspects some possibilities in breeding more desirable stocks and stated that the State agricultural experiment stations are the agencies looked to by most farmers for assistance in their forestry problems. The passage of the Cooperative Farm Forestry Act of May 18, 1937, which contemplates the development of forest production as one phase of farm economics, farm management and land utilization, has brought forward some questions of the relationships of the Federal Department of Agriculture and State agencies as regards its re-

search aspects, and this matter formed the subject of a brief report by the committee on experiment station organization and policy. Presented by its acting chairman, Director H. W. Mumford of Illinois, the report argued that the development of forestry is parallel and supplemental to other farm enterprises, with ultimate best use of land from the standpoint of soil conservation and potential farm income as the objective. This concept necessitates the closest possible integration and relationship of research under the act in all its phases, including marketing and utilization, to research in all other agricultural enterprises. To maintain this close relationship, it was advocated that research under the act should be from the beginning established and carried forward in cooperation with the agricultural experiment stations, and it was recommended that in order to accomplish this end such research operate under written memoranda of understanding between these stations and the Department.

The possibilities of cooperation between the States and the Department in the task of assembling, organizing, condensing, and evaluating information already in published form were considered in a discussion opened by Prof. Emil Truog of Wisconsin, in which he drew attention to the situation presented by the enormous accumulation of scientific literature during the past 25 years and the ever-increasing rate of production. Stating that "the abstracting and indexing services which we now have are excellent" and that "these should be continued and extended," he recommended the setting up of supplementary machinery, such as "the publication at intervals of 10 years or so of comprehensive digests of the more important subjects, giving not only a complete bibliography of the literature involved but also a summary and appraisal of this literature" and the preparation and distribution of abstracts on cards. The undertaking of this work by State agencies giving particular emphasis to the topic in mind, with supplementary assistance from the Department of Agriculture, was suggested.

The topic was further considered in a paper by Dr. J. T. Jardine, Chief of the Office of Experiment Stations and Director of Research for the Department. Dr. Jardine recalled the cooperation in effect between the Department and the States during the past 3 years with reference to information on plant and animal improvement and soils, much of which has been printed in recent Yearbooks of the Department (E. S. R., 77, p. 737). He also referred to other joint undertakings, such as the preparation of the annual Agricultural Outlook and the carrying on of the soil survey. In his opinion the desirability of cooperative effort in many lines has been generally accepted, but he maintained that each new project should be considered on its individual merits as to feasibility, timeliness, and utility. In conclu-

sion he pointed out that "in research the need is to make progress into the unknown. Summaries of available information are helpful but should be used mainly as aids (1) in deciding what further research is needed and (2) to stimulate ideas as to how to penetrate further into the unknown effectively. . . . I agree with Mr. Truog fully that the enormous increase in the amount of literature pertaining to many important agricultural subjects makes advisable some real thought as to improvement in our procedure for keeping research workers advised as to the status of research findings and current activities." The ensuing discussion still further emphasized the need for full consideration of the subject, and steps were taken to achieve this end through action by the standing committees of the association.

Largely because of the anniversary phases, the research program was somewhat more restricted in scope than usual, and little was heard on many matters frequently receiving attention. However, this concentration upon a few topics was not without its advantages, especially as opportunity was available for a reasonably full consideration of urgent matters.

The trend toward increased cooperation in research, both institutional and individual, continued to be very noticeable, and was one of the outstanding features. Doubtless it was definitely stimulated by the spirit of mutual interest and good will which was characteristic of the meetings as a whole. Its growth is one of the most encouraging factors in a generally favorable situation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A new electron microscope, L. C. Martin, R. V. Whelpton, and D. H. Parnum (*Jour. Sci. Instruments, 14 (1937), No. 1, pp. 14–24, figs. 6*).—Since the "resolving limit," or smallest resolvable distance between microscopic details, has already been reduced, in the case of the optical microscope, to the smallest likely to be practically possible. "It will be seen that the real problem of reducing the r. l. depends upon diminishing the wavelength of the radiation used. The fact that electrons can be focused in the same way as ordinary light (as will be described below) is therefore very important, since the wavelength of electrons is extremely small. For low accelerating potentials, the wavelength of an electron is given by $\lambda = (150/V)^{1/2} \times 10^{-4}\mu$, in which V is the potential in volts. For V=50,000 v, this gives a wavelength of $5.5 \times 10^{-6}\mu$. Taking this wavelength and assuming an N. A. [numerical aperture] of 1.6, the r. l. is $1.7 \times 10^{-6}\mu$. At present the maximum N. A. which can be successfully used is of the order of 0.02, in which case the r. l. is $1.4 \times 10^{-4}\mu$. The optical limit is thus 1,000 times larger. With process plates a magnification of about 400,000 would be needed to show structure of this size, but certain practical difficulties remain to be overcome before full advantage can be taken of this very low r. l.

"It is well known that a beam of electrons can be deflected by electric or magnetic fields. The general study of the behavior of electrons in such fields is called electron-optics. It may be shown that any arrangement of axially symmetric electric or magnetic fields will act like a lens on an electron beam. If the object and image spaces are field-free regions, then we have the analogue of a lens with constant initial and final refractive index. Electrostatic lenses may be produced by any system of charged axially symmetric conductors, such as cylinders or disks, and these arrangements are generally employed for low-velocity electrons. For high-speed beams it is usually more convenient to use current-carrying coils. These two types are known respectively as electrostatic and magnetic lenses."

The authors have designed and made a new two-stage electron microscope for microscopy by means of electron beams. The apparatus includes an optical microscope, and means are provided to bring any required object detail from the optical to the electron system. The focusing coils are mounted in the vacuum, and the design allows of the centering of the various parts on the electron beam axis. Magnifications as high as 10,000 diameters have been attained.

A technic for staining cells with Sudan III in a water phase, J. Dufrenoy and H. S. Reed (*Stain Technol., 12 (1937), No. 2, pp. 71, 72*).—At the University of California the authors were able to stain certain spherical cell inclusions (apparently of a lipoid nature and occurring within the vacuoles of the affected cells in cases of "mottle-leaf" of orange trees) with Sudan III in a largely aqueous phase by the following method:

"A strong solution of Sudan III was first prepared in 5 cc of methylal. This was poured into a small vial and 10 to 20 cc of water added. The water first mixes with the methylal, but in a few minutes the liquids separate, leaving the lower, light-orange phase containing water + methylal + Sudan III and an upper phase containing methylal + Sudan III + water.

"When free-hand sections of tissue whose cells contain intravacuolar spheres (for instance, leaves of *Callistephus sinensis* [*chinensis*] affected by the virus of 'spotted wilt') were immersed in the liquid, they either sunk to the bottom of the vial or floated at the interface. In either case they were in contact with a water phase from which they absorbed some Sudan III. As they absorbed dye from the water phase, dye entered from the upper concentrated solution. Sections were transfererd to a slide at the end of 30 min. and studied under the microscope. The intravacuolar spheres of lipoid material were stained bright orange. In the course of several hours the methylal may become hydrated to an extent that Sudan III no longer stays in solution, but it remains in solution long enough for the technic above described."

Certain relationships between the calcium and oxalate content of foliage of certain forest trees, R. F. CHANDLER, JR. (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 5, pp. 393–396*).—An investigation carried out at the [New York] Cornell Experiment Station has brought out a relationship between the calcium and oxalate content of the foliage of various forest trees.

The total oxalates in the leaves were, in general, found to be correlated with the total calcium content. In none of the species studied did the total oxalates exceed the total calcium content. Except in two species, all of the oxalates were present as calcium oxalate. It was found, however, that the calcium content of the leaves of some trees may be high in the absence of oxalates.

A method of determining the proteins of leaves [trans. title], I. E. ZNAMENSKIĬ (ZNAMENSKY) (*Trudy Bot. Inst. Akad. Nauk SSSR, Ėksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2* (*1936*), *pp. 273–282*).—This is a description of the method, with a general discussion and bibliography of 30 titles.

Variations of certain chemical and physical properties of butter fat as revealed by melting time, W. D. GALLUP, A. H. KUHLMAN, and R. M. WALDBY (*Oil & Soap, 14* (*1937*), *No. 5, pp. 124–126, figs. 3*).—Employing a method for the determination of the melting time of butterfat samples as described, the Oklahoma Experiment Station has demonstrated that the hardness and melting point of butterfat are each directly proportional to the melting time. An inverse relationship, somewhat less definite than the above mentioned, was found to exist between the iodine number of the fat and its melting time. The data presented permit the estimation of indexes for hardness and melting point from melting time values.

Use of isopropyl ether in a modified Mojonnier fat test, J. J. JOHNSON (*Jour. Dairy Sci., 20* (*1937*), *No. 9, pp. 563–566*).—Experimental evidence is presented indicating the suitability of the substitution of isopropyl ether for ethyl and petroleum ether in making butterfat determinations on various dairy products by the Mojonnier method. The use of isopropyl ether eliminated the presence of solids-not-fat in the fat extract and proved to be timesaving, more convenient, and cheaper. Certain precautions to be observed in the use of isopropyl ether are indicated.

A national survey of methods for the determination of sediment in butter and cream, G. F. STEWART (*Jour. Dairy Sci., 20* (*1937*), *No. 8, pp. 509–519*).—This is a report of a cooperative undertaking sponsored by the Research Committee of the American Association of Creamery Butter Manufacturers.

All sections of the country were represented by cooperating plants, and the results of 784 cream sediment tests (three grades of cream used in each test) and 2,261 butter sediment tests are presented. Standard lintine disks and milk sediment testers were used in these studies, and the sediment pads were scored according to the Connecticut Official Milk Sediment Standards (1931). All cream samples were tested by the soda, lye, ammonia, and acid methods, and all butter samples by the soda, hot-water bath, borax, and acid methods. Both products were most satisfactorily tested by the acid method, while the lye method for cream and the borax method for butter showed the greatest number of unsatisfactory filtrations. Certain of the acid solvents tested resulted in undissolved curd or curd scum which caused the pads to appear abnormally dirty.

Removal of fluoride from water, E. ELVOVE (*Pub. Health Rpts.* [U. S.], *52 (1937), No. 38, pp. 1308–1314*).—The results of experiments are reported which indicate that fluoride can be removed from drinking water with the aid of tricalcium phosphate, magnesium hydroxide, or magnesium oxide.

Methods for study of growth-promoting substances [trans. title], F. LAIBACH and R. LOTZ (*Biochem. Ztschr., 288 (1936), No. 3–4, pp. 250–256, figs. 3*).—The authors describe an automatic apparatus for the extraction of growth substances without heating or access of air, a simple process for the removal of cell-injurious constituents from growth-substance extracts, a comparatively simple and rapid method for demonstrating growth substances in plant organs, materials other than lanolin suitable as bases for preparation of growth-substance pastes, and a simple method of determining the rapidity and duration of delivery of growth substances from these pastes to water.

An improved color test for vitamin A, A. E. PACINI and M. H. TABAS (*Jour. Amer. Pharm. Assoc., 26 (1937), No. 8, pp. 721–723*).—A modification of the Carr-Price test for computing the vitamin A potency of oils is described. A stable purple color which develops into bright red is produced when 1 drop of a vitamin A oil reacts with 1 drop of guaiacol, 2 drops of phenol, and 1 cc of perchloric acid in 5 cc of chloroform. This improved test has the advantage of not reacting with inactive carotene and not producing the purple color except in the presence of vitamin A.

Crystalline vitamin B_1 from natural sources, R. D. GREENE and A. BLACK (*Jour. Amer. Chem. Soc., 59 (1937), No. 7, pp. 1395–1399*).—The authors describe the preparation of pure crystalline vitamin B_1 from rice polish and from yeast by a process which involves two adsorptions on fuller's earth, extraction with acid salts of nitrogen bases such as pyridine, and the use of organic solvents. A study of the distribution of vitamin B_1 in immiscible solvent-water systems showed that a number have high solubility for the vitamin, and the high solvent power of phenol and cresol is taken advantage of in the purification process. A method of purification from rice polish, which is described in detail, yields crystals containing an average of 325,000 international units of vitamin B_1 per gram, which is fully as active as the synthetic vitamin.

Riboflavin (*Jour. Amer. Med. Assoc., 109 (1937), No. 7, p. 507*).—The method of purification and the properties of the heat-stable factor riboflavine of the vitamin B complex are described under new and nonofficial remedies. The factor, formerly called lactoflavine, vitamin B_2, and G, has the formula

6,7-dimethyl-9-[d,1'-ribityl]-iso-alloxazin, $C_{17}H_{20}N_4O_6$.

Thiamin chloride, P. N. LEECH ET AL. (*Jour. Amer. Med. Assoc., 109 (1937), No. 12, p. 952*).—By the decision of the Council on Pharmacy and Chemistry of the American Medical Association the name thiamin chloride has been adopted for vitamin B_1 hydrochloride, with the provision that if the International Com-

mittee on Nomenclature in 1938 "should adopt some other suitable name, the council will feel free to concur in the use of the international name, with thiamin chloride as a synonym. It is understood that if other salts are found suitable they should be named accordingly 'thiamin sulfate', 'thiamin bromide', and so on."

Researches on the activity of oxidation products of vitamin B_1 [trans. title], W. H. Schopfer and A. Jung (*Arch. Mikrobiol., 7 (1936), No. 5, pp. 571–578, fig. 1*).—Treating vitamin B_1 with H_2O_2 caused it to lose its activity for *Phycomyces*, and an extract of wheat germs submitted to the same oxidant caused it to lose its activity for *Phycomyces* and yeast. The pure vitamin oxidized by H_2O_2 was also inactive for animals. Thiochrome obtained by oxidation of pure vitamin by potassium ferricyanide, inactive for animals, was equally so for *Phycomyces*, or at most possessed only a very feeble action.

It was not possible by the oxidation method to separate bios and vitamin B_1 in a complex extract.

Adsorption of vitamin B by plant tissue (by Solanum melongena Linn. and Raphanus sativus var. longipinnatus Bailey) when pickled with salt and rice bran, C. D. Miller (*Jour. Nutr., 13 (1937), No. 6, pp. 687–694, fig. 1*).—In continuation of a previous study (E. S. R., 70, p. 569), the author reports the results of biological tests made by the method of Chase and Sherman on the vitamin B (B_1) content of eggplant after pickling in salt and rice bran for 3 days and of takuan, a product prepared from daikon or white radish, by pickling with salt and rice bran for one week. The extracted plant juices of the pickled vegetables reached a pH of 4.8, which appears to be a favorable condition for the penetration and adsorption of vitamin B_1 from the rice bran by the plant tissue.

The vitamin B_1 content of the eggplant increased from approximately 20 to 40 Chase-Sherman units and of the takuan from approximately 6 to 110–120 per 100 g after pickling. Commercially pickled takuan tested after a period of some months had a vitamin B_1 content of approximately 40 units per 100 g.

Estimation of vitamin C by chemical titration, L. J. Harris (*5. Cong. Internatl. Tech. et Chim. Indus. Agr., Schéveningue, 1937, Compt. Rend., vol. 1, pp. 112–118*).—The 2,6-dichlorophenolindophenol titration method for the estimation of vitamin C is discussed briefly from the standpoint of history of the method, outline of technic, possible interfering substances, application, and proposed modifications, with brief references to alternative methods.

Concerning the details of the method as applied to biological materials, four points are emphasized: "(1) As a general rule proteins should first be removed and a clear solution obtained by means of a preliminary grinding with sand and trichloracetic acid; (2) the extraction should be carried through and the actual titration of the extract begun with as little delay as possible; (3) the titration should be performed at an acid reaction; [and] (4) the titration end-point should be reached within 2 min."

Of possible interfering substances, free cysteine and free ergothionine are considered unimportant constituents of the materials likely to be tested. Moreover, cysteine reduces the dye much more slowly than ascorbic acid. Thiosulfate is considered unimportant in saturation tests, as the reducing value of the urine in large scale experiments runs very closely proportional to the past intake. In manufactured food articles heated sugars and yeast are thought to be the most likely sources of interference. Germinating seedlings are likely to give anomalous results.

If precautions are taken to prevent enzymatic oxidation of the vitamin, values for raw vegetables are as high as for boiled. Micromethods are to be

preferred, particularly for such materials as raw fruits and vegetables which contain much fibrous material.

Of various modifications, reduction with hydrogen sulfide according to Van Eekelen and Emmerie is considered not only unnecessary for routine work but as introducing a source of actual danger in giving rise to reducing artifacts. The use of chloroform to take up the dye may be advantageous with highly colored substances. The use of metaphosphoric acid, as first recommended by Fujita, is thought to be an advantage.

Vitamin C in vegetables.—VI, A critical investigation of the Tillmans method for the determination of ascorbic acid, G. L. Mack and D. K. Tressler (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 735–742, fig. 1*).—In continuation of the series of studies at New York State Experiment Station noted on page 285, this paper presents a modification of the extraction procedure in the Tillmans method (E. S. R., 69, p. 7) for the determination of ascorbic acid, in which oxidation is prevented by using a strongly ionized acid such as sulfuric acid to reduce the pH of the extract to a point where enzyme action is completely inhibited.

While the proposed modification is not intended to eliminate the hydrogen sulfide treatment in exploratory work, the results of tests show that it gives the same maximum value for the ascorbic acid as when hydrogen sulfide or stannous chloride is used to reduce the dehydroascorbic acid. The elimination of the hydrogen sulfide treatment simplifies the analytical procedure. The erroneously high titration values for lima beans and carrots, obtained after prolonged treatment with hydrogen sulfide in the absence of sulfuric acid, are attributed to the presence of interfering substances which were reduced by the hydrogen sulfide. The increase in the ascorbic acid content of an aqueous cabbage extract upon heating is attributed to the decomposition of the dehydroascorbic acid.

Dehydroascorbic acid reductase, E. F. Kohman and N. H. Sanborn (*Indus. and Engin. Chem., 29 (1937), No. 2, pp. 189, 190*).—Attention is called to the oxidative effects on ascorbic acid in plant tissues ascribed by various investigators to a specific oxidase, and the comment is made that since plant life is endowed with an oxidation-reduction system there must be an opposite reducing effect. As an illustration, previous work of the authors[1] is cited in which off-flavors developing in raw frozen vegetables were attributed to anaerobic enzyme activity and which involves reduction. Recent observations have shown that raw pea juice was capable of restoring the reducing value of 2,6-dichlorophenolindophenol after its destruction by aeration alone or by catalysis with copper or by oxidation with the dye itself. "If this dye is a measure of ascorbic acid, a basis on which many workers are publishing data, then there exists in raw pea juice a 'dehydroascorbic acid reductase.' In the writers' experiments it resulted in the production of the equivalent of 15 mg ascorbic acid per 100 cc in 5 to 6 hr. Heated pea juice or raw cabbage juice did not yield the same results. In fact, a loss of dye-reducing effect was found instead."

The carotene of milk fat (butter), A. E. Gillam and M. S. El Ridi (*Biochem. Jour., 31 (1937), No. 2, pp. 251–253*).—In this investigation analytically pure butter carotene was isolated from a mixed sample of colostrum and milk fat and was shown to be practically pure β-carotene by chemical analysis, determination of the melting point, absorption spectra, and optical rotation.

An improved method for determination of blood carotene, E. Daniel and G. J. Scheff (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 26–30*).—The

[1] Indus. and Engin. Chem., 26 (1934), No. 7, pp. 773–776, fig. 1.

authors point out that of the various methods hitherto used some require samples too large to permit of the carrying out of serial determinations, some are nonspecific in that other polyene colors (e. g., xanthophyll) are determined as carotene, and none are entirely satisfactory. The following statement outlines the principles upon which the new procedure here described is based:

"The carotenoids are precipitated completely from the blood serum by deproteination with alcohol. The dye is removed from the protein precipitate by repeated extraction with ether. After saponification of the lipoids and xanthophyll esters in the ether extract, the polyene hydrocarbons and xanthophyll dyes are separated from each other by dispersing them in a mixture of methyl alcohol and ether-petroleum ether ('Entmischung'). The carotenes are contained in the upper layer and may be determined in it colorimetrically."

In the step referred to as dispersion "in a mixture of methyl alcohol and ether-petroleum ether", the ether extract, after repeated washing with water until the washings are neutral to litmus, is mixed with the same volume of petroleum spirit (*b. p. 50° to 60° C.*), and "*by adding one volume of methyl* alcohol (85 percent) to the above-mentioned dye extract, the carotenes are recovered in the upper (ether-petroleum ether) layer, while the xanthophylls are held in the lower (methyl alcohol) layer."

The full procedure, on the basis of a 3-cc blood sample, is given in detail.

The chemical activation of sterols, I–IV (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 71–80; 117 (1937), No. 2, pp. 655–661; 119 (1937), No. 2, pp. 621–630, 631–640*).—Four papers from the Iowa Experiment Station are presented.

I. *The nature of the floridin activation of cholesterol*, L. Yoder.—Chemical tests are reported which show that the administration of a mixture of silicic and sulfuric acids to rachitic rats produced a positive response. It would appear that sulfuric acid is the activating constituent of floridin. It was found that 2 mols of sulfur trioxide in carbon tetrachloride formed an antirachitic substance from cholesterilene such that the administration of 10 mg produced positive pH and line tests in rachitic rats. The chief reaction product was identified as the barium and calcium salts of a monosulfonic acid of cholesterilene.

II. *The chemical activation of cholesterol and various cholesterol derivatives*, J. C. Eck, B. H. Thomas, and L. Yoder.—Tests show that cholesterol provitamin D is not the precursor of the active substance produced by the action of sulfuric acid, acetic anhydride, or cholesterol, or certain of its derivatives. It is suggested that a specific relationship exists between the chemical configuration and the chemically activatable cholesterol and cholesterol derivatives.

III. *The chemical activation of cholesterol*, J. C. Eck and B. H. Thomas.—The effect of various proportions of acetic anhydride and sulfuric acid on the activation of cholesterol was studied. It was established that an antirachitic substance is produced which is activatable by ultraviolet irradiation when cholesterol is treated with sulfuric acid-acetic anhydride, sulfuric acid, sulfoacetic acid, fuming sulfuric acid, and chlorosulfonic acid.

IV. *The chemical activation of cholesterol and cholesterilene by various reagents*, J. C. Eck and B. H. Thomas.—The effect of various acids and salts as reagents in converting cholesterol and cholesterilene into antirachitic products was studied. Hot treatment with potassium acid sulfate, copper sulfate, zinc chloride, aluminum chloride hexahydrate, phosphoric anhydride, trichloroacetic acid, aluminum chloride in benzene solution, or phosphoric acid-acetic anyhdride in acetic acid solution converted cholesterol into an antirachitic product. Cholesterilene yielded an antirachitic product when heated with potassium acid sulfate, ammonium acid sulfate, phosphoric anhydride, or hydrogen chloride in ether solution.

Further studies on the antihemorrhagic vitamin, H. J. ALMQUIST (*Jour. Biol. Chem., 120 (1937), No. 2, pp. 635–640*).—In further efforts to concentrate and purify the antihemorrhagic vitamin (E. S. R., 77, p. 676), an improved process involving a new type of "molecular" distillation apparatus is described by which it was possible to obtain the vitamin in the form of a colorless crystalline fraction of low melting point. This product contains one or more benzine rings but no indole grouping as previously indicated. Results of bio-assays on various fractions and preparations of this vitamin are reported.

Crystals with vitamin K potency, H. J. ALMQUIST (*Nature [London], 140 (1937), No. 3531, pp. 25, 26*).—This note deals with the above-described procedure.

Preparation of tomato products, C. S. PEDERSON (*New York State Sta. Circ. 178 (1937), pp. 8, fig. 1*).—Causes of failure in the home preparation of various tomato products, means for avoiding such defects, and specific directions for the home preparation of catsup, chili sauce, Thousand Island dressing, canned tomatoes, tomato juice, tomato juice cocktail, and tomato pulp or purée are presented.

Maraschino cherries, W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 9, pp. 263–265, 277, 279, 281, 283, figs. 2*).—The author of of this paper from the California Experiment Station presents a summary of the method commercially used in the preparation of maraschino cherries, with some comments and recommendations.

A method of improving sweet wines, W. V. CRUESS and L. HOHL (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 9, pp. 261, 262, fig. 1*).—The authors of this contribution from the California Experiment Station call attention to the dilution, by the high-proof spirit added in the preparation of fortified sweet wines, of the nonsugar solids to which the richness of flavor of wines is largely due. To avoid such dilution of important flavor constituents, the authors propose a preliminary fermentation. "By this fermentation procedure only a very small addition of brandy is required. Therefore, the dilution is relatively slight and the extract is diluted but little."

The oil:gossypol ratio of cottonseeds and its possible effect on the refining loss of crude cottonseed oil, W. D. GALLUP (*Okla. Acad. Sci. Proc. [Okla. Univ.], 16 (1936), pp. 90–93*).—The use of a complete fertilizer for cotton at the Oklahoma Experiment Station was found generally to increase the gossypol, but either nitrogenous or phosphatic fertilizer substances usually decreased the gossypol content. The oil content was usually higher when the gossypol content was increased. A definite local difference between seeds produced in two counties was noted. Seeds from early- and late-developing bolls showed no consistent differences in oil or gossypol content.

Since it is known that fractional percentages of gossypol lessen the alkali-refining loss by from 1 to 8 percent, "it seems reasonable to assume that, other factors being equally influential, seeds of high oil content will by virtue of their higher gossypol content yield oil with a lower refining loss than with seeds of low oil content."

A laboratory evaluation of wood preservatives, R. E. WATERMAN, J. LEUTRITZ, and C. M. HILL (*Bell System Tech. Jour., 16 (1937), No. 2, pp. 194–211, figs. 12*).—"Evolution of a simple laboratory technic for the assay of materials proposed for use in the preservation of wood is reported in this paper. This test involves a measurement of the actual decay resistance of the treated wood. Included are a résumé of the limitations imposed by current test methods and a discussion of the adaptations of this new technic to the numerous variables inherent in laboratory simulations of outdoor exposure."

AGRICULTURAL METEOROLOGY

Forecasting the weather a year ahead (*Pop. Mech. Mag.*, *68* (*1937*), *No. 2, pp. 210–213, 125A, 126A, figs. 8: abs. in Sci. Digest, 2* (*1937*), *No. 3, pp. 27–29*).—It is stated that "weather experts who are developing the science of air-mass analysis can make predictions for the next two or three days that are correct nine times out of ten." It is suggested that through further development of this system it may be possible to make useful and reliable weather forecasts for a whole season in advance. Briefly explaining the air-mass system, it is pointed out that "accurately to gage the weather by it, forecasters have to assemble on charts hundreds of reports coming in by radio and telegraph from airplanes, ships, and ground weather stations. Each air mass is different, but on the charts the migrations of the masses may be plotted several days ahead of the time that they reach a district, and in that way the probable weather disturbances and their probable times of arrival are anticipated."

A method of predicting night minimum temperatures, C. J. BOYDEN (*Quart Jour. Roy. Met. Soc.* [*London*], *63* (*1937*), *No. 271, pp. 383–389, figs. 5; abs. in Sci. Abs., Sect. A—Phys., 40* (*1937*), *No. 476, p. 818*).—This article develops a simple general relationship, which appears to be applicable in any climate, "connecting monthly mean values of maximum and minimum dry-bulb temperatures with mean wet-bulb temperatures. The formula is extended for perdicting individual minimum temperatures on nights when there is no appreciable change of air mass between the times of maximum and minimum temperature, allowance being made for wind speed, cloudiness, and fog formation."

On a period of 27 months in the rainfall, S. W. VISSER (*K. Akad. Wetensch. Amsterdam, Proc.*, *40* (*1937*), *No. 6, pp. 513–517, figs. 2*).—Clear indications are reported of a 27-mo. period in rainfall in eastern America, on Iceland, and in western Europe, apparently connected with the warm currents of the North Atlantic Ocean. The study was part of an investigation into the possibility of long-range weather forecasing in the Netherlands.

Great American floods, E. V. NEWNHAM (*Sci. Prog.* [*London*], *32* (*1937*), *No. 126, pp. 305–307*).—The floods of March–April 1926 and January 1937 in the United States are briefly discussed, with the general conclusion that "the incidence of great floods requires the simultaneous presence of two essentials: Firstly, the continued presence of an area of high pressure over the southern part of the North Atlantic in such a position that the moist southeast winds on its southwestern side pass directly into the American continent; and secondly, the existence of southward-moving masses of polar air which elevate the damp, warm air when the two currents meet."

The influence of wind on the soil temperature and the definition of heat transmission coefficient, N. P. FOMIN (*Zhur. Geofiz.* (*Jour. Geophys.*), *6* (*1936*), *No. 5, pp. 439–451, figs. 3; Eng. abs., pp. 450, 451*).—Investigations are reported which showed that "the temperature regime of a soil monolith with the surface exposed to the action of air stream differed considerably from that of the monolith being in the same temperature conditions but without air stream at its surface. In the monolith's upper layers, in the air stream (up to 15 cm) the amplitude of the temperature oscillations was 3–4 times larger, if compared with the monolith in the absence of wind. The analysis of factors which could cause such a difference as, for instance, evaporation and radiation, has shown that during the experiments these factors could not produce such effect. This phenomenon was well accounted for by assuming that the heat transmission coefficient a, or, as it is sometimes called, the 'external heat conduction'

coefficient, increased for the air stream passing through the soil surface is proportionate to this coefficient." An attempt was made to ascertain the numerical value of *a*, defining the heat transmission coefficient from air to soil applicable in specific cases.

Climatic cycles and tree growth.—Volume III, A study of cycles, A. E. DOUGLASS (*Carnegie Inst. Wash. Pub. 289, vol. 3 (1936), pp. X+171, pls. 24, figs. 58*).—This is the third volume of a comprehensive study of climatic cycles and tree growth (E. S. R., 60, p. 417) carried on for many years under the auspices of the Carnegie Institution of Washington.

It is stated that the present work is based on a view sustained by recent advance, namely, that having developed an appropriate method of analysis of data, attention should now be given to those climatic changes which seem to occur in nonpermanent but still obviously cyclic form. Many of these have been indicated by past work and might with advantage receive consideration in connection with problems of reclamation and hydraulic engineering as well as in climatology. The relation of tree growth to sunspot frequency and long-range forecasting of rainfall is especially considered.

The climates of the continents, W. G. KENDREW (*Oxford: Clarendon Press, 1937, 3. ed., rev., pp. XII+473, figs. 160; abs. in Sci. Prog. [London], 32 (1937), No. 126, pp. 364, 365*).—This is a third revised edition of a book previously noted (E. S. R., 48, p. 508), taking account of recent advances in the subject.

The climates of North America.—I, Mexico, United States, Alaska, R. DEC. WARD and C. F. BROOKS (*Handbuch der Klimatologie*, edited by W. KÖPPEN and R. GEIGER, *Band II, Teil J. Berlin: Borntraeger Bros., 1936, vol. 2, pt. J, pp. X+[2]+J326+[1], figs. 52*).—This is a part of what is planned to be a 5-volume treatise on world climatology (E. S. R., 76, p. 750).

Human and physical resources of Tennessee.—II, Climate, C E. ALLRED, S. W. ATKINS, and B. D. RASKOPF (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 40 (1937), pp. IV+21-31, figs. 7*).—Continuing this series (see p. 162), it is stated that the climate of Tennessee is characterized by an abundance of well-distributed rainfall, relatively long growing season, mild temperatures, and high percentage of days with sunshine. The average temperature is 58.6° F., varying from 54.3° in northeastern Tennessee to 60.4° in southwestern Tennessee. The average July temperature varies from 70° in northeastern Tennessee to 80° in the western part of the State. The average January temperature in these areas is 36° and 41°, respectively. The annual number of days with temperature continuously below freezing is 5 to 10. The average annual precipitation is 49.9 in., with 9.5 in. in autumn and the remaining 40.4 in. almost equally distributed in the other seasons. The average snowfall is 10.9 in., and snow remains on the ground from 1 to 30 days. The State has an average of 154 clear days, 101 partly cloudy, and 110 cloudy. Approximately 60 percent of the total possible sunshine is available.

Climatology (*Univ. Adelaide, So. Austral., Waite Agr. Res. Inst. Rpt., 1933-36, pp. 77-79, fig. 1*).—A statistical study of rainfall records at Adelaide indicated that during the 95 yr. 1839-1933 the fluctuations in the total yearly rainfall were such as may be expected from a chance distribution, showing no evidence of change, and that seasonal distribution is subject to a rhythmical movement with a period and amplitude of approximately 23 yr. and 30 days, respectively. The ratio of rainfall to evaporation was found to be of value in determining the limiting soil moisture conditions for such insects as the lucerne flea and the plague grasshopper.

SOILS—FERTILIZERS

[Soil and fertilizer investigations by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 13–28, 54, 55, fig. 1*).—Progress along various lines of investigation is summarized as to water absorption as a factor in soil management, by R. S. Smith and R. S. Stauffer; absence of danger of sulfur shortage in Illinois soils, by E. E. DeTurk, R. H. Bray, and J. C. Anderson; differences in tightness of substrata found in Illinois soils, by Smith; investment returns from livestock and grain systems of management and relation of soil treatment responses to levels of natural soil productivity, both by F. C. Bauer et al.; cultivation, crop rotation, and soil treatment as factors in soil conservation, by Bauer, A. L. Lang, and C. H. Farnham; value of potash in increasing the soil-improvement value of sweetclover, by DeTurk et al.; effect of the newer phosphates on Illinois soils, by DeTurk and Anderson; improvement in the quality of limestone sold in Illinois, by DeTurk and E. B. Earley; and utilization of straw in soil improvement, by O. H. Sears.

[Soil research by the Missouri Station] (*Missouri Sta. Bul. 387 (1937), pp. 85–94, figs. 2*).—The report summarizes current investigations in notes of the following captions and authorships: Studies on the calcium content of soils and on its relation to acidity and the response of soils to liming, the use of limestone on soils, and the effects of soil treatments, long continued, upon bacterial activity in the soil, all by W. A. Albrecht; particle size in relation to the physicochemical properties of clay, by L. D. Baver and D. M. Whitt; petrographic study of colloidal clays, by Baver and R. M. Smith; aggregation of soils and calcium ion saturation, by Baver; nitrogen and carbon accumulation or loss, by M. F. Miller and Albrecht; soil erosion control, fertilizer experiments, and Missouri pasture soil, all by Miller and H. H. Krusekopf; the theory of exchange adsorption (base exchange) and seat of base exchange in clay crystals, both by H. Jenny; and migration of ions in clay gels, by Jenny and E. Winters.

[Soil and fertilizer work of the North Carolina Station, 1934] (*North Carolina Sta. Rpt. 1934, pp. 13, 14*).—The report gives data on magnesia deficiencies of sandy soil types, by L. G. Willis and J. R. Piland; oxidation-reduction potentials of some highly organic acid soils; the immediate effect of fertilization upon soil reaction in the zone of fertilizer application, by C. B. Williams and Willis; and the effect of calcium compounds and of soil and fertilizer reaction upon the tolerance of bright tobacco to chlorine in fertilizers, by Piland and Willis.

A handy borer for soil surveyors, A. Salminen (*Soil Sci., 43 (1937), No. 5, pp. 377, 378, fig. 1*).—An apparatus is described in a contribution from the Central Experiment Station of Finland.

A new jack for pulling soil-sampling tubes, J. H. Stoeckeler (*Soil Sci., 43 (1937), No. 5, pp. 379–383, pl. 1, fig. 1*).—The author describes, in a contribution from the U. S. D. A. Lake States Forest Experiment Station at St. Paul, Minn., a tool consisting of a hollow steel puller or wedge block which slips over the top of the soil tube, two curved steel wedges which fit snugly inside the wedge block and outside the tube, and a steel handle which is used on a wood-block fulcrum to pry the tube from the soil. A downward push on the handle tightens the wedges in the block and lifts the tube from 6 to 8 in. The process is repeated until the tube is loose enough to be withdrawn by hand. It is advisable to use a wooden, lead, or brass hammer for either separating the wedge block from the wedges or tightening the latter, to avoid "burring" their edges and destroying their smooth grip.

The use of collapsible tubes for storing soil samples for moisture estimation, A. N. Puri and A. Sarup (*Soil Sci., 43 (1937), No. 5, pp. 375, 376*).—After comparing various means for transporting soil samples from the point of collection to the laboratory for determinations of the field moisture content, the authors of this contribution from the Irrigation Research Institute, Lahore, India, "found that collapsible tubes of the type generally used for storing dental creams are excellent for this purpose. The screw cap is cut off, and the opening hammered and soldered. . . . The tubes used were 10.5 cm long and 2.5 cm in diameter. They held 30–40 g of soil. The tubes are numbered in serial order with a punch mark, and the weight of each is recorded . . . .

"The soil sample is thoroughly mixed by hand and about three-quarters of the tube filled with it. The mouth of the tube is closed with a pair of flat-nosed pliers by pressing the edge and bending it over twice. The tube with the soil is brought in the laboratory and weighed. The mouth is then opened and the tube placed in a stand and dried in the oven at 100°–110° C. for 24 hr. and weighed again. The soil is then tipped out and the tube, after cleaning, can be used again.

"To test the utility of the tube under extreme conditions a number of experiments were performed with the following results: (1) Three closed tubes containing a wet soil (about 18 percent moisture) did not lose any moisture in 5 days when placed in a desiccator over calcium chloride. (2) Two closed tubes containing a wet soil did not lose any moisture in 1 mo. when kept on a shelf in the laboratory. (3) Twenty tubes used five times for storing samples, drying, etc., did not show any appreciable change in their original weights. (4) Nine tubes used five times for regular moisture estimation, and then heated intermittently in an electric oven for 5 days, did not lose any appreciable weight."

A sensitive hydrometer for determining small amounts of clay or colloids in soils, G. J. Bouyoucos (*Soil Sci., 44 (1937), No. 3, pp. 245–247, pl. 1*).—The author of this contribution from the Michigan Experiment Station notes that "the hydrometer in general use heretofore for making mechanical analysis of soils has a total range of 0 to 60 g a liter and is graduated in grams. Obviously a hydrometer with these characteristics does not allow a high degree of accuracy when only small amounts of clay or colloids are present. To remedy this defect, an especially sensitive soil hydrometer has been devised which has a range of 0 to 10 g a liter and is graduated into 0.2-g divisions. This special hydrometer is heavy, has a large, streamline bulb, comes to equilibrium quickly, and is accurate." The author presents data showing a comparison of the amounts of soil indicated by the hydrometer in soil suspensions with the amounts that were found experimentally by evaporating the soil suspensions to dryness and weighing the residue.

A simple type of electrical salinometer for estimating soluble salts in soils and irrigation waters, A. N. Puri and B. Anand (*Soil Sci., 44 (1937), No. 3, pp. 241–244, figs. 2*).—A simple type of electrical salinometer for estimating total solids in irrigation waters and salt solutions is described in a contribution from the Irrigation Research Institute, Lahore, India.

In principle, it involves a potentiometric method, using large potential difference and a dip electrode made of copper and chromium plated. By using a high voltage the polarization electromotive force is made small as compared to the potential difference across the electrodes. The depth of immersion of the dip electrode is made adjustable for the purpose of compensation for temperature differences, a calibrated scale of degrees being placed upon the dip electrode to facilitate this adjustment. Calibration of the instrument for

percentages of saline concentration by measurements on known concentrations of sodium chloride is recommended. Numerous comparisons have shown that "the results compare very well with the usual method of drying and weighing the residue."

Note on accuracy of soil thermographs, W. V. Turnage (*Soil Sci., 43 (1937), No. 6, pp. 475, 476*).—At the Tucson, Ariz., Desert Laboratory of the Carnegie Institution of Washington, soil thermographs indicated diurnal temperature variations at depths of 3 ft. and more, although "from other methods of measuring temperatures, we knew that no diurnal variation occurred at the 3-ft. depth and below. . . . When the recording mechanism was placed in an insulated compartment, in which there occurred only small daily temperature variations, no variation was noted on the thermograph chart. The conclusion appears to be that the expansion chamber must be protected from extremes of temperature. When heat was applied to the expansion chamber, the thermograph's recording pen indicated a fall, and, conversely, when the chamber was cooled, the pen indicated a rise. Throughout the test, the temperature around the bulb itself did not change. Diurnal changes of less than 10° F. around the expansion chamber did not produce any variation in the record made by the recording pen."

An automatic watering system for pot cultures, R. K. Calfee and J. S. McHargue (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 797–800, figs. 4*).—"The system consists essentially of an open tube, filled with sand, having one end extending into a water supply and the other in contact with the culture. For convenience in filling the tube and elimination of air pockets, the tube is extended above the surface of the culture and contact with the culture made through holes in the wall of the tube at a point near the bottom of the pot." The authors of this note from the Kentucky Experiment Station also describe a siphon arrangement which avoids perforating the bottom of the pot and the top of the bench.

Marshall County soils, E. Winters, Jr., and R. S. and L. H. Smith (*Illinois Sta. Soil Rpt. 59 (1937), pp. 27, pls. 2, figs. 9*).—Marshall County possesses 352,500 acres of gently rolling to level and well-drained lands in the north-central part of the State. The upland soils have developed from glacial deposits, the bottom lands from alluvial deposits derived by erosion from the glacial material. Loess of varying depth covers parts of the area, the thickness reaching 20 ft. along the Illinois River bluffs.

The report lists 28 types, representing 22 series, of which the Muscatine and Tama silt loams, 24.56 and 12.27 percent, respectively, are the most extensive.

Putnam County soils, H. Wascher and R. S. and L. H. Smith (*Illinois Sta. Soil Rpt. 60 (1937), pp. 30, pl. 1, figs. 9*).—Putnam County occupies an area of 109,664 acres in the north-central part of the State. The county lies in a region of "considerable relief" and is well drained, mostly by natural drainage.

The report describes 21 series, inclusive of 26 types, the list being led by the Tama, Muscatine, and Clinton silt loams, which occupy, respectively, 17.15, 17.05, and 11.19 percent of the total area of the county. Swamp, lake, and Illinois River areas amount to 9.73 percent.

Wabash County soils, R. S. and L. H. Smith (*Illinois Sta. Soil Rpt. 61 (1937), pp. 28, pl. 1, figs. 8*).—Wabash County, southeastern Illinois, occupies 139,456 acres of moderately rolling lands having fully adequate drainage in the uplands and, in the bottom lands too nearly level to have good surface drainage, a good adaptability for tile drainage.

Bluford silt loam, the most extensive soil, totals 31.39 percent of the area of the county. Bonnie silt loam follows with 13.2 percent. In all, 27 series, represented by 32 types, were differentiated in the survey here noted.

The mineralogical composition of the very fine sands of some Pennsylvania soils, C. D. Jeffries (*Soil Sci., 43 (1937), No. 5, pp. 357–366*).—At the Pennsylvania Experiment Station the very fine sand of five Pennsylvania soils was separated by mechanical analysis and subsequently subdivided by means of heavy liquids (bromoform and dilutions of this with light petroleum) into the three mineral groups (1) the heavy minerals, having a specific gravity greater than 2.86, (2) the quartz minerals, having a specific gravity greater than 2.62 but less than 2.86, and (3) the feldspar minerals, having a specific gravity less than 2.62. Improved methods for separating the mineral groups quantitatively according to their specific gravities were developed. After separation of the mineral groups, the various minerals were identified by standard petrographic methods and the relative proportions estimated. It was concluded that "the mineralogical composition of the very fine sand separates varied considerably as to amounts, but not as to variety, of mineral species. In the mineralogical study of soils, certain generally occurring minerals are useful for purposes of comparison and correlation. In the case of the Pennsylvania soils studied, these minerals are feldspars, zircon, tourmaline, muscovite, chlorite, hornblende, and rutile. It was possible to study quantitatively the occurrence of certain minerals in the soil and to use data thus obtained as an aid in soil classification."

Human and physical resources of Tennessee.—I, Geology, topography, soils, C. E. Allred, S. W. Atkins, and B. D. Raskopf (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 38 (1937), pp. IV+20, figs. 4*).—This report names and describes 30 varieties of geological formation found in Tennessee and its 8 main topographical and soil divisions.

"Tennessee soils vary in texture from the heavy clays of the East Tennessee Valley to the sandy soils of the Cumberland Plateau. In fertility, they range from poor gravel and slate hill soils in portions of the Highland Rim to very fertile valley loam and river bottom alluvial soils, such as the Brown loams of the West Tennessee Plateau slope and the Mississippi Bottoms. Wide variations in productivity of soils occur within small regions."

The laws of soil colloidal behavior.—XVIII, Colloidal electrolytes.—XIX, The gel and the sol complex in soil formation, S. Mattson and Y. Gustafsson (*Soil Sci., 43 (1937), No. 6, pp. 421–452, figs. 14; 453–473, pl. 1, figs. 8*).—The two papers here noted extend a series (E. S. R., 74, p. 162) begun at the New Jersey Experiment Stations and continued as contributions from the College of Agriculture, Uppsala, Sweden.

The first of the present papers discusses the theory of the interaction of colloidal hydroxides with colloidal and soluble acids. "By determining the ultimate pH and the titration curves of electrodialyzed samples, when single and when mixed, it has been shown that soils having different isoelectric points (or pH of exchange neutrality) interact in a general way according to the theory of ampholytes. In the case of amphoteric colloids the mutual neutralization proceeds, however, further, because of the limited dissociation of their salts." The chemistry of exchange acidity, exchange alkalinity, and the point of exchange neutrality is considered, the authors reaching the conclusion that "the reactions of the soil colloidal complex are fundamentally the same as the reactions of ordinary weak electrolytes and can be accounted for by a special application of the known laws of ordinary weak acids and bases and of ampholytes."

In the second paper the anionic and cationic sol complex, obtained at different pH in the extracts from various mixtures of soil and humis, is discussed with respect to its composition and isoelectric point. "It has been found that there is a minimum of solvation at a pH which corresponds to the isoelectric point of the gel complex in the mixture. Above this pH, the sol complex is anionic and more acidic than the gel complex, whereas it is cationic and more basic than the latter at lower pH. Applied to the process of soil formation, a distinction is made between anionic solvation and eluviation leading to Laterites, Red and Brown earths, and cationic solvation and eluviation leading to podzolic soils."

The organic matter content and moisture relations of some cropped and virgin soils, H. F. Murphy (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *16* (*1936*), *pp. 36, 37*).—Soils in various parts of Oklahoma were examined with reference to organic-matter content and water-holding capacity. Cropping was found to have resulted in a loss of from about 18 percent to more than 35 percent of the original organic-matter content. The cropped soils had also a lessened capacity for retaining water above the wilting percentage, the available water retained by cropped soils being about 80 percent of that retained by the same soils before cropping.

The effect of organic matter on the infiltration capacity of Clarion loam, F. B. Smith, P. E. Brown, and J. A. Russell (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 7, pp. 521–525, fig. 1*).—In an investigation reported from the Iowa Experiment Station infiltration measurements were made on manured and unmanured Clarion loam both in the field and in the laboratory.

Large variations in the infiltration rate among replicate samples of soil were evident in both laboratory and field determinations. Though there was a considerable variation in the rate of infiltration among replicate samples of soil, the differences between manured and unmanured soils were shown to be significant when the determinations were made in the field. The infiltration capacity of Clarion loam in a 4-yr. rotation of corn, corn, oats, and clover was found to be relatively high, but it was increased materially by additions of manure.

Nutrient content and base exchange properties of organic layers of forest soils in the Lake States region, S. A. Wilde, S. F. Buran, and H. M. Galloway (*Soil Sci.*, *44* (*1937*), *No. 3, pp. 231–239, pl. 1, figs. 2*).—In an investigation carried out at the Wisconsin Experiment Station, the nutritive properties, base-exchange capacity, and reaction of the important morphological varieties of humus were investigated with reference to nursery practice.

"The results show that the organic remains formed under normally developed stands of a given composition and on a certain soil type can be considered as a material of definite fertilizing value. Hardwood-hemlock duff formed on heavy morainic soils proved to have a fertilizing value unsurpassed by that of any other type of organic remains in the Lake States region. Hardwood-spruce-fir duff, hemlock duff, and hardwood mull duff, formed on heavy outwash or morainic soils, approached in quality the hardwood-hemlock duff. White pine duff from glacial gravelly sandy loams showed a decidedly lower fertilizing value than the previously mentioned types. Aspen-white birch duffs from the same sites were similar to white pine duff. Norway pine duff and jack pine duff developed on outwash sandy soils, as well as true mull humus from hardwood stands, were found to be the lowest in fertilizing value. The results of this study indicate that the importance of the underlying mineral soils should be taken into consideration in a classification of organic remains for practical purposes."

A close correlation between the content of essential nutrients in different types of organic remains and the growth of Norway spruce seedlings when treated with these remains was demonstrated in the greenhouse.

Loss of plant nutrients from peat soil, B. D. Wilson and E. V. Staker (*[New York] Cornell Sta. Mem. 206 (1937), pp. 16, fig. 1*).—Peat soil, held in galvanized iron cans provided with outlets, was leached with distilled water to ascertain the loss of plant nutrients from the soil. The soil in some of the cans received no nutrients, that in others being treated with various quantities of nitrogen, phosphorus, and potassium. In some cans the soil was planted, in others it was kept bare. The investigation was conducted in a greenhouse for a period of 5 yr.

"Calcium was lost from the soil in much larger amounts than was any of the other nutrients studied. Its removal in the drainage water from the bare soil was greater than that in the drainage water and the crops combined from the planted soil. Cropping conserved the calcium in the soil in large measure. Next to calcium, nitrogen was removed from the soil in greatest amount."

Phosphorus was lost in significant amounts in the drainage water, but relatively large amounts were retained in the soil.

"Comparatively large amounts of potassium were removed from the soil, but this element was also held in considerable amount by the soil. The findings suggest that the cation was absorbed in some degree by the soil with the replacement of calcium.

"Cropping was found to conserve the sulfur and the magnesium of the soil, as well as the calcium. In this and in many other respects, the removal of plant nutrients from peat soil in the drainage water was found to be similar to that which has been reported for mineral soils."

• **The erosive character of the Solonetz-like B horizon**, H. F. Murphy (*Okla. Acad. Sci. Proc. [Okla. Univ.], 16 (1936), pp. 80–82*).—The author describes soils found in "numerous so-called alkali spots or slick spots" in central Oklahoma, the A horizon, when not destroyed by erosion, being a sandy loam, while the B horizon shows the columnar structure. It is shown that the construction of terraces from such soil may easily do more harm than good, in that the alkali-spot soil is not only in itself readily erosible but causes deflocculation of normal soil when brought into contact with it.

"The data indicate that it is not advisable to build the terraces through these Solonetzlike areas with the material at hand, but it is necessary to bring in soil from off the area. Quite often these Solonetzlike areas are the starting point for gullies. The sodium-laden soil complex starts washing away more or less in a channel off the spot and is deposited along the way. Gradually reaction between the normal soil in the channel and this sodium complex occurs, producing a deflocculated soil condition along the slight channel, and the soil in the channel is ready for removal with the rains which follow. Fills in these gullies should not be made with Solonetzlike material because they will not stand up but will, by their removal and deposition further along the channel, only increase the erosiveness of the soil along the way."

The deposition of dust in central Oklahoma during the 1935 dust storms, H. F. Murphy (*Okla. Acad. Sci. Proc. [Okla. Univ.], 16 (1936), pp. 74, 75*).—The author determined the rate of deposition of dust at the Oklahoma Experiment Station and made analyses of the samples obtained. The quantity deposited reached 312 lb. per acre in 2 days during a dust storm. The samples obtained were of very fine silt, grayish brown, and with an organic-matter content of 4.05 percent, 240 p. p. m. of phosphorus soluble in 0.2 N sulfuric acid, and the total phosphorus content 0.058 percent.

Occurrence of masses of gelatinous microbes in the soil, Y. Okada (*Soil Sci., 43 (1937), No. 5, pp. 367–371*).—"In the soil of some regions in the central part of Japan there occur gelatinous masses which are almost exclusively composed of microbes with a gelatinous capsule. The position of these microbes in systematic botany is not yet definitely settled. The present paper is a preliminary report on the description of the localities, the method of occurrence, and the microscopic and chemical properties."

Formamide and ammonium formate as nitrogen sources for plants, B. E. Brown and F. R. Reid (*Soil Sci., 43 (1937), No. 5, pp. 341–347, pl. 1*).—In view of the fact that formamide, which has been proposed for use in ammonia solutions for the ammoniation of superphosphate, is hydrolyzed, when a formamide-urea-ammonia mixture is used, with the formation of ammonium formate, the authors of this contribution from the U. S. D. A. Bureau of Plant Industry made 11 greenhouse pot tests to evaluate formamide and ammonium formate as nitrogen sources in complete fertilizer for oats, wheat, and millet in comparison with urea and ammonium sulfate.

"Considering all tests, formamide was better than urea five times and ammonium formate was better than urea seven times. Compared with ammonium sulfate both formamide and ammonium formate produced higher yields four times. Expressed as total dry-weight yield for all indicator crops on the different soils, the formamide mixture produced 231.5 g, the urea mixture 231.9 g, the ammonium formate 235.7 g, the ammonium sulfate 244.6 g, and the control, P-K mixture, 101 g.

"It is probably true that the nitrogen in formamide and ammonium formate under normal soil conditions is converted fairly quickly to nitrate form. This fact helps to explain the response of oats, wheat, and millet of these compounds. The results of the vegetative pot tests show that formamide and ammonium formate compared favorably with the standard nitrogen sources."

Soil liming investigations.—III, The influence of calcium and a mixture of calcium and magnesium carbonates on certain chemical changes of soils. IV, The influence of lime on yields and on the chemical composition of plants, J. A. Naftel (*Jour. Amer. Soc. Agron., 29 (1937), No. 7, pp. 526–536, figs. 2; 537–547, figs. 2*).—Continuing earlier work on this subject (E. S. R., 76, p. 309), the author reports in two further papers the following observations of certain Alabama soils:

In paper 3 he notes that "the reaction of the soil changed linearly through the point of 75 percent of the Ca sorption capacity and then approached a maximum of approximately pH 8.0 at the equilibrium or saturation point. The decomposition of $CaCO_3$ increased regularly with the increments of lime added until the saturation point was reached. The increase in exchangeable and water-soluble Ca accounted for practically all of the $CaCO_3$ decomposed at the lower increments, but this was not true at the higher increments of liming. A portion of the Ca of the decomposed $CaCO_3$ was converted to the nonexchangeable forms. Readily soluble P was more than doubled by the added lime. Exchangeable K was decreased with each increment of $CaCO_3$ but for some unknown cause increased with the $CaMg(CO_3)_2$ additions. Lime replaced the exchangeable Mn directly with the amount added. In some instances no Mn was found after heavy liming."

In paper 4 the author states that "crop yields were increased on the Norfolk, Hartsells, and Cecil series of soils by liming. The third increment of lime, equivalent to 75 percent of the Ca-sorption capacity of the soils, was generally found to be the optimum rate of liming on these soils. The crops used gave little response to lime on the Decatur and Kalmia soils, since these soils in their

native states are highly saturated with bases. A greater growth response was obtained from Ca.Mg lime than from Ca lime. This was especially true for the last two crops grown on the lighter-textured soils.

"Liming with increasing increments of $CaCO_3$ increased the percentage Ca in the plants but decreased the Mg, K, P, Mn, and Fe. This was especially true on the light-textured soils and to the extent that certain mineral constituents of the crops were considerably decreased. Where the soils were limed with $CaMg(CO_3)_2$, there were similar decreases in mineral content with the exception of Mg, which was increased."

Discussion of machine fertilizer placement experiments in Virginia, H. H. Zimmerley (*Natl. Joint Com. Fert. Appl. Proc., 12 (1936), pp. 25–31*).—A report is presented of experiments on machine placement of fertilizers conducted cooperatively by the Virginia Truck Experiment Station and the U. S. D. A. Bureau of Agricultural Engineering. Work was done with snap beans, peas, kale, spinach, onions, tomatoes, early cabbage, and Fordhook lima beans, and special attention was devoted to the effect of placement on germination of seed and on yield. The results substantiate those obtained during the previous 3 yr., indicating that fertilizer applied in the row either directly beneath the seed or mixed with the soil in the row reduces germination and in most cases results in a reduction in yield. Application in bands from 2 to 3 in. on each side of the seed and 1 or 2 in. below the level of the seed has in general been less injurious to germination and given higher yields than other methods of application. In a few instances broadcast treatment has proved as satisfactory as application in bands, but this method of application is not to be generally recommended because in previous years the yields have generally been lower than with machine placement.

The results with transplanted plants, such as tomatoes and cabbage, this year indicate that placement in bands may not be as satisfactory as the method of applying a part of the fertilizer in the row and mixing with the soil before planting, and side-dressing later in rather wide bands on both sides of the row and mixing the fertilizer thoroughly with the soil by cultivation. Further experiments will be necessary before definite recommendations can be given growers for fertilizing transplanted plants in the eastern Virginia trucking area.

Analyses of commercial fertilizers (*South Carolina Sta. Bul. 311 (1937), pp. 56*).—This is the usual report, for 1936–37, of the annual fertilizer analyses.

Commercial fertilizers, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 426 (1937), pp. 23*).—In addition to the 1937 report of the annual fertilizer analyses, this bulletin notes a 54 percent increase in the total fertilizer tonnage as compared with that of 1936 and a very large increase in recent years in the consumption of superphosphate, of which the tonnage sold in 1937 was 6.5 times that used in 1931–34.

With respect to the acidifying effects of complete fertilizers, it is estimated that "it would require an application to Vermont soils of 720 tons of limestone to neutralize the acidity developed by the 10,400 tons of complete fertilizer which were sold here this year."

AGRICULTURAL BOTANY

Statistical ecology, E. Ashby (*Bot. Rev., 2 (1936), No. 5, pp. 221–235*).—"A study of the literature to which this essay is an introduction will convince the student that statistics have been applied to the most varied ecological problems, often needlessly, and sometimes on false assumptions. It is a literature remarkable for its prolixity, but from its pages there emerge methods which are

new to biology and which prove valuable in the difficult study of plant distribution. It must be left to the future to decide in what measure these methods can advance botany." A bibliography of 42 titles is included.

Permanent pollen tube slides with the vapor method of changing reagents and dehydration, O. J. Eigsti (*Stain Technol., 12 (1937), No. 2, pp. 53, 54*).—"The use of dioxan in the vapor jar fixes the pollen tubes embedded in ovary tissue and replaces the lactic acid with dioxan, and prepares the material for permanent mounting in balsam." Permanent mounts by the method detailed have been kept for several months with no apparent change in the tissues.

Retention of plant colors, W. D. Pierce (*Science, 84 (1936), No. 2176, pp. 253, 254*).—Flower and leaf colors were found well preserved in many species when dried rapidly between blotters after placing the fresh material on plain cardboard (or cards overspread with Dennison's transparent tape) and covering them with overlapping strips of Scotch cellulose tape (with rubber adhesive) pressed smoothly and tightly over them, or covering them with plain cellophane sealed down with the adhesive tape. If mounted on cellophane cards the specimens are visible on both sides.

A histological stain from the black walnut (Juglans nigra L.), C. R. Limber and J. T. Gamble (*Stain Technol., 12 (1937), No. 2, pp. 49, 50*).—The extraction of the dye from hulls of *Juglans nigra* and its use in histological work are described. It is said to be a nuclear stain, giving a brown coloration in chromatin material. Ferric alum gave the best results as a mordant, and picroformal, picrosulfuric, and mercuric chloride fixatives proved most satisfactory.

A new moisture indicator for wood, M. E. Dunlap (*Instruments, 9 (1936), No. 10, p. 282, figs. 3*).—A new, low-cost instrument is described, employing the relationship between relative humidity and moisture content of hygroscopic materials. Determination of the moisture content of wood is accomplished with the new instrument by drilling a 0.5-in. hole, a little over 1.5 in. deep, in the wood to be tested, and measuring the humidity that develops therein.

Actions taken by the Second International Microbiological Congress in London, 1936, regarding bacteriological nomenclature, R. St. John-Brooks and R. S. Breed (*Jour. Bact., 33 (1937), No. 4, pp. 445–447*).—The principal actions taken were as follows: *Bacillus* is accepted as a "genus conservandum," with the type species "*B. subtilis* Cohn *emendavit* Prazmowski, 1880"; generic homonyms are not permitted in the group *Protista*, and it is held "advisable to avoid homonyms amongst *Protista* on the one hand, a plant or animal on the other," and "while specific substantive names derived from names of persons may be written with a capital initial letter, all other specific names are to be written with a small initial letter."

On the problem of the nature of the action of bacteriorhizal microorganisms on plants, A. A. Isakova (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1936), No. 9, pp. 429–432*).—The results obtained led to the conclusion that there exists a specificity of the bacteriorhizas for various plants and for their effects on germinating seeds. The introduction of bacteriorhizal complexes into the medium stimulated the sprouting of seeds, and seedlings from inoculated seeds were larger and more vigorous. The results obtained are believed to indicate that the original action of the micro-organisms should be regarded as of hormonal nature rather than as a modification of the nutritional regime.

On the true influence of bacteriorhizal microorganisms on the germination of seeds, II, A. A. Isakova (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 14 (1937), No. 7, pp. 463–465*).—Continuing the above studies, it is con-

cluded that crop plants exhibit individual reactions to bacteriorhizas. Thus cotton and wheat seeds were most reactive to their own bacteriorhizas, while oat seeds showed a poor reaction to its specific forms. It is believed that the bacterial complex selected by the root system affects the plant through the metabolic products discharged into the surrounding medium.

On the physiology of the formation of nodules on legume roots, K. V. Thimann (*Natl. Acad. Sci. Proc., 22 (1936), No. 8, pp. 511–514*).—That the development of nodules is due to the production of an auxin by the nodule bacteria is indicated by the tests here described.

The behavior of paired monosporous mycelia of Fomes roseus (Alb. & Schw.) Cooke and Fomes subroseus (Weir) Overh., I. Mounce and R. Macrae (*Canad. Jour. Res., 15 (1937), No. 4, Sect. C, pp. 154–161, pl. 1, figs. 12*).—"*F. roseus* and *F. subroseus* are heterothallic and bipolar. With one exception, complete interfertility exists between haploid mycelia derived from different sources. The exception is of particular interest since it shows that two cultures of *F. roseus* from widely separated sources possess one interfertility factor in common. *F. roseus* and *F. subroseus* may be differentiated on the basis of their spore characters. The failure to obtain clamp connections in any of the many pairings of a haploid mycelium of *F. roseus* with a haploid mycelium of *F. subroseus* only serves to emphasize that these two fungi are distinct."

The chemistry and physiology of the pectins, J. Bonner (*Bot. Rev., 2 (1936), No. 10, pp. 475–497, figs. 2*).—The structure and colloidal behavior of pectic substances are of interest to the chemist, but they are also plant products of the greatest interest to the botanist and physiologist who study their manifold functions in the plant and the relation of chemical structure to these functions. This review attempts to show that the pectic substances are of interest to the most varied viewpoints, and that all these viewpoints have contributed to our present knowledge of the subject. The bibliography consists of 75 titles.

α- and β-amylase in ripening wheat seeds [trans. title], P. S. Ugrümow (*Biochem. Ztschr., 282 (1935), No. 1–2, pp. 74–78*).—In the early stages of ripening two components of the amylolytic complex were found—one possessing a preeminently saccarifying action, designated as β-amylase, and the other evoking a rapid dextrinization of starch, as α-amylase.

Studies of nuclear structure in vegetative and reproductive cells of Nicotiana sylvestris (N, 2N, and 4N), H. T. Northen (*Amer. Jour. Bot., 24 (1937), No. 2, pp. 90–95, figs. 16*).—This paper from the University of Wyoming reports a study of the responses of nucleoli, chromosomes, nuclei, mitotic or meiotic figures, and cytoplasm to a centrifugal force of 1,000 × gravity, 1,500 × gravity, or 3,700 × gravity in germinal and somatic cells of *N. sylvestris* (1*n*, 2*n*, and 4*n*).

The structure of the growth rings in the secondary wall of the cotton hair, T. Kerr (*Protoplasma, 27 (1937), No. 2, pp. 229–241, pls. 2, fig. 1*).—"The secondary wall of the cotton hair is a complex and coherent matrix, and the appearance of layering in swollen fibers is due to a structural differentiation of the cellulose into an alternation of compact, strongly birefringent zones with more porous, comparatively isotropic lamellae." The details of its structural development are outlined and illustrated.

Salient lines of structural specialization in the wood parenchyma of dicotyledons, D. A. Kribs (*Bul. Torrey Bot. Club, 64 (1937), No. 4, pp. 177–187, pls. 2, fig. 1*).—The investigation was based on the study of 782 genera of dicotyledonous woody plants.

Adventitious roots in stem cuttings of Begonia maculata and B. semperflorens, A. I. SMITH (*Amer. Jour. Bot.*, *23* (*1936*), *No. 7*, *pp. 511–515*, *figs. 8*).—Adventitious roots in the young stem cuttings originated in the interfascicular cambium and occasionally in the fascicular cambium at the edge of the bundle. Further details regarding their origin and development are given.

Leaf differentiation in angiosperms, A. S. FOSTER (*Bot. Rev.*, *2* (*1936*), *No. 7*, *pp. 349–372*, *figs. 10*).—This review (with 70 titles in the bibliography) contributed from the University of California considers the leaf initiation at the growing point; the origin of the petiole, midrib, and lamina; and foliar determination in angiosperms.

Some observations on the absorption and exosmosis of electrolytes by storage organs, with particular reference to potato and artichoke tubers, G. F. ASPREY (*Protoplasma*, *27* (*1937*), *No. 2*, *pp. 153–168*, *figs. 4*).—"The effect of differential periods of immersion of potato and artichoke tissue in running tap water on their subsequent exosmosis and absorption of electrolytes has been investigated."

Subsequent exosmosis by potato tuber discs into distilled water varied inversely with the duration of exposure. The usual course of exosmosis into distilled water was followed, no matter how long the tissue was subjected to tap-water treatment. Relatively rapid initial excretion of electrolytes was followed by their gradual reabsorption. The absorption of ions from ammonium chloride solutions by tuber slices was greatly increased by previous immersion in running tap water for periods up to 120 hr. Absorption of ions from ammonium chloride solutions varied inversely as the excretion of electrolytes from the tissue, which was inconsistent with expectations based on ionic exchange.

Artichoke tubers behaved differently, since neither their subsequent exosmosis nor intake of ammonium chloride could be notably altered by the method used.

"The results are discussed in the light of, firstly, purely physical effects which may be ascribed to the prolonged immersion of these storage organs in running tap water and, secondly, physiological and biochemical changes occurring in the tissues. The latter would seem to offer more promise of a satisfactory explanation."

Plant tissue cultures, P. R. WHITE (*Bot. Rev.*, *2* (*1936*), *No. 8*, *pp. 419–437*).—In this comprehensive review of plant tissue cultures and their applications, such a culture is defined as "any preparation of one or more isolated, somatic plant cells which grows and functions normally, in vitro, without giving rise to an entire plant."

A bibliography of 132 references is included.

The influence of the temperature of the culture water on the water absorption by the root and on the stomatal aperture, T. TAGAWA (*Jour. Faculty Agr., Hokkaido Imp. Univ.*, *39* (*1937*), *No. 4*, *pp. 271–296*, *figs. 8*).—Between 0° and 30° C., a rise of water temperature caused a gradual increase of the rate of water absorption by the seedling roots of *Phaseolus vulgaris* in water culture. The stomata opened widely when the roots were kept in water at 0°, but the plant became flaccid due to a decrease in water absorption. With rises in temperature up to 20° a gradual closure of the stomata occurred, while between 20° and 30° a gradual opening took place concomitant with an increase in water absorption, though the degree of opening was not as great as in the first case. It is believed that the cold injury may be due in some cases to a disturbance of the water balance in the plant body rather than to any direct effect of low temperatures.

Effect of variation of temperature on the respiration of flower (Helianthus annuus), A. GUHA THAKURTA and B. K. DUTT (*Bose Res. Inst., Calcutta,*

Trans., *10 (1934–35)*, *pp. 93–111*, *figs. 6*).—Respiratory activity was depressed when the flower was subjected to prolonged high temperature. The initial effect of raising the temperature was an enhancement of respiratory activity, which increased with the temperature up to 52° C., "the critical temperature maximum." Above this point the respiratory rate underwent a marked decline until death, which occurred above 55°. The seasonal variation had no effect on the critical temperature maximum. The temperature coefficient of respiration for the flowers was found to be fairly constant from 32° to 52°, but at lower temperature ranges it was comparatively higher. The optimum temperature for respiration was found by determining the particular temperature at which the maximum respiratory rate remained approximately constant for a fairly long time (e. g., 6 hr.). This optimum for *H. annuus* was found to be about 34°.

Vernalization of winter rye during ripening, F. G. Gregory and O. N. Purvis (*Nature* [*London*], *138* (*1936*), *No. 3501*, *p. 973*, *fig. 1*).—Vernalization is reported as successfully applied while the ears remained attached to the parent plant.

Photoperiodism of the cotton plant, N. N. Konstantinov (*Fotoperiodizm khlopchatnika. Moskva* (*Moscow*): *Vsesoiuzn. Akad. Selsk. Khoz. Nauk Lenina, Sred. Nauch. Issled. Inst. Khlopkov.* [*Lenin Acad. Agr. Sci., Sci. Res. Cotton Inst. Middle Asia*], *1934*, *pp. 80*, *figs. 17*; *Eng. abs.*, *pp. 72–74*).—In these investigations (1929–32) conducted at the Central Plant Breeding Station of the Central Asia Institute of Cotton Research, over five species of cotton were tested under 6, 9, and 12 hr. of illumination daily, with the summer day of from 14 to 15 hr. as control. The conclusions were as follows:

According to the accepted classification, cotton should be placed among the short-day plants. The earliest and early forms did not respond to shortening of the day, intermediate forms exhibited a slight reaction, while some of the perennial, arboreous forms showed the strongest effects. The length of day producing optimum photoperiodic reactions varied from 8 to 12 hr. for the different cotton varieties. Shortening of the day to 6 hr. led to eventual starvation. The basic change induced by shortening of the day consisted in lowering the level at which the first fruiting branch is formed, resulting in earlier setting of flower buds and earlier blooming and ripening. A very strong shortening of the day led to a slowing down of the rate of blooming.

The photoperiodic reaction was correlated with the geographic origin of the cotton variety, being most intense in the equatorial cottons and lessening in intensity with increase in altitude. For a series of cottons the natural duration of day of their native habitats is probably not the optimum one.

The type of photoperiodic reaction differed for different forms of cotton, and three types are described. The observational evidence appeared to justify the assumption that by selecting a suitable set of factors affecting the growth of the plant the antagonism between reproductive and vegetative development in most cases may be removed.

Though as yet not fully proved, the experiments appeared to indicate that in a series of forms of cotton a photoperiodic "aftereffect" exists, but in order to preserve this effect a certain minimum duration of the influence of the short day on the plant is necessary.

Since, in the genus *Gossypium*, there exists a great variety of adaptations to periodicity of illumination, it is believed that this character may, to a certain extent, serve a taxonomic purpose. Probably also this factor has played an important role in the geographical distribution of species of cotton.

It is thought that the short-day method should play an important role in practical breeding operations, allowing a more detailed study of the commercial

values of a series of cottons and making it possible to bring together the blooming dates of annual and perennial forms for hybridization and development of better commercial varieties.

Does the combined effect of all spectral zones in white light cause an increase of their individual photosynthetic action? [trans. title] C. MONTFORT (*Ber. Deut. Bot. Gesell., 55 (1937), No. 2, pp. 142–156, figs. 3*).—Based on the results of this study, the hypothesis that the total photosynthetic performance in white light amounts to more than the sum of the partial effects of its individual spectral zones is believed to have validity for neither green nor brown assimilatory tissues.

The effects of continuous and of intermittent illuminations on phototropism, S. C. DAS and B. K. PALIT (*Bose Res. Inst., Calcutta, Trans., 10 (1934–35), pp. 47–59, figs. 5*).—With regard to photosynthetic action, intermittent illumination is, under certain conditions, relatively more effective than continuous light, the modifying condition being the frequency of intermittence. Moreover, the relative efficiency of intermittent light proved to be at its maximum at a high frequency of intermittence. When the frequency of intermittence underwent a decline, the effectiveness of intermittent light also exhibited a depression.

The effects of continuous and of intermittent illuminations on longitudinal growth, S. C. DAS and B. K. PALIT (*Bose Res. Inst., Calcutta, Trans., 10 (1934–35), pp. 61–71, figs. 2*).—Using devices especially developed for the purpose, it was found that retardation of the longitudinal growth rate in cosmos seedlings was, generally speaking, greater under intermittent than under continuous lighting. Even with regard to the relative efficiency of intermittent lights, quicker frequencies of intermission were relatively more effective. A wider generalization was reached with regard to the action of continuous v. interrupted lights on green plants, since such diverse activities as photosynthesis, phototropism, and growth were found to undergo modifications essentially of similar character.

Behavior of the plastid pigment in photoperiodically reacting plants with different photic rations [trans. title], B. K. KAR (*Planta, Arch. Wiss. Bot., 26 (1937), No. 3, pp. 420–462, figs. 9*).—*Lactuca sativa, Soja hispida, Phaseolus vulgaris,* and *Triticum* were used in this study.

The light field and leaf pigments [trans. title], A. SEYBOLD and K. EGLE (*Planta. Arch. Wiss. Bot., 26 (1937), No. 3, pp. 491–515, figs. 5*).—This is a qualitative and quantitative study of various sun and shade plants and leaves and of emersed and submerged water plants in relation to leaf pigments.

Pigments of the oat coleoptile, G. WALD and H. G. DU BUY (*Science, 84 (1936), No. 2176, p. 247*).—The oat coleoptile grown in darkness appeared colorless but was found to contain xanthophyll and carotene in very low concentration. This may account for its sensitivity to wave lengths below 550 mμ, characteristic of the absorption spectrum of carotenoids.

The physiological possibilities of growth acceleration in plants by chemical and physical agents which are not nuclear nutrient materials, I, III [trans. title], G. H. VELTMAN (*Forschungsdienst, 1 (1936), No. 11, pp. 836–848; 2 (1936), No. 1, pp. 26–38*).—Part 1 gives a critical review (with bibliographical footnotes) of the nomenclature of the subject, the growth-promoting substances of plant origin, animal hormones, and dyes. Part 3 considers stimulatory agents (true stimulants and biocatylizers) and growth accelerators (physical influences).

The influence of zinc, iron, copper, and their combinations on the growth of Aspergillus niger [trans. title], F. GOLLMICK (*Zentbl. Bakt.* [*etc.*],

Z. Abt., *93* (*1936*), *No. 23–26*, *pp. 421–442*, *figs. 6*).—The study was carried out, in general, with nutrient solutions freed from heavy-metal impurities by means of animal charcoal.

Influence of carbon monoxide, ethylene, and $KMnO_4$ upon the development and harvest of hemp [trans. title], P. I. SABAEV (*Khim. Sotsialist. Zeml.* (*Chem. Socialist. Agr.*), *No. 10* (*1936*), *pp. 42–50*, *figs. 4*: *Eng. abs.*, *p. 50*).—Treatment of hemp seeds with carbon monoxide and ethylene before sowing influenced positively the initiation and acceleration of development of the plant in all phases (budding, flowering, and ripening). The increased development of the root system is especially noted. Both seeds and total yield were increased by the treatments, and carbon monoxide also influenced the germination. In weak concentrations, potassium permanganate appeared to stimulate hemp development in all its phases.

Growth of wheat seedlings in solutions containing chemical growth substances, D. R. MARMER (*Amer. Jour. Bot.*, *24* (*1937*), *No. 3*, *pp. 139–145*, *figs. 4*).—"A quantitative study was made of the growth of root, coleoptile, and leaf, and the initiation of lateral roots of wheat seedlings in a wide range of concentrations of indole-3-acetic acid, indole-3-propionic acid, and indole-3-butyric acid at pH 4.6 and pH 7.5. The addition of the growth substances to media buffered at both pH values brought about a decrease in the growth of the primary root, coleoptile, and first leaf, and an increase in the number of secondary roots."

Effect of 3-indole acetic acid on cell walls of stem and root, W. J. ROBBINS and J. R. JACKSON (*Amer. Jour. Bot.*, *24* (*1937*), *No. 2*, *pp. 83–88*, *fig. 1*).—"Stem wall material (cotton thread, hemp cord) stretches more under the influence of a weight when treated with lanolin containing 0.2 percent indoleacetic acid than when treated with lanolin alone. Stem wall material (paper strips, dried strips of potato tuber, twigs of elm, stems of *Ambrosia*) bends more after treatment with lanolin containing 0.2 percent indoleacetic acid than with lanolin alone. Roots (corn, willow, *Chenopodium*, and *Ambrosia*) bend less when treated with lanolin containing 0.2 percent indoleacetic acid than with lanolin alone. It is suggested that these results may explain why the growth hormone increases the growth of stems but inhibits the growth of roots. It may increase the extensibility of stem walls and decrease that of root walls.

"The conclusion that the chemical or physical constitution of stem walls differs from that of root walls follows."

Histological and microchemical studies of the reactions of tomato plants to indoleacetic acid, H. A. BORTHWICK, K. C. HAMNER, and M. W. PARKER (*Bot. Gaz.*, *98* (*1937*), *No. 3*, *pp. 491–519*, *figs. 20*).—An internode terminated by a cut surface failed to enlarge after decapitation unless the cut surface was treated with indoleacetic acid-lanolin mixture, but internodes so treated enlarged at about the same rate as the internodes below. The first observed change after treatment was an enlargement of the epidermal and cortical cells. Many of the stem tissues of treated plants became meristematic. Most parenchymatous cells in the 0.5–2 mm zone from the treated surface underwent some divisions, the endodermal cells, external and internal phloem parenchyma, and adjacent pith cells exhibiting greatest activity. The epidermis, most of the pericycle, sieve tubes and companion cells, and internal fibers showed little or no meristematic activity. A ring of adventitious roots formed around the stem as a result of activity in the external phloem, portions of the active band of endodermal cells covering the tips of the roots as they pushed through the cortex. Another ring of such roots formed near the pith as a result of activity of cells in the internal phloem and adjacent pith.

Nitrates were more concentrated in the controls. The protein concentration in treated stems increased in areas where cell divisions became more abundant. Starch disappeared from cells of the treated stems as the tumors enlarged, but remained in the controls.

Is heteroauxin a growth-promoting substance? L. H. Leonian and V. G. Lilly (*Amer. Jour. Bot., 24 (1937), No. 3, pp. 135–139, figs. 15*).—"Fungi, algae, and detached roots and shoots of aseptically germinating corn grains were tested to determine if their growth was stimulated by various concentrations of heteroauxin ranging from one part in ten thousand to one in ten million parts of nutrient medium. It was found that without a single exception the higher concentrations of the heteroauxin proved toxic and the lower concentrations failed to induce any stimulation. Corn roots and shoots did better in the checks than in the presence of the greatest dilution of heteroauxin. It is concluded that insofar as these experiments are concerned, heteroauxin is a growth-inhibiting rather than a growth-promoting substance." This is a contribution by the West Virginia Experiment Station.

Plant growth effects of heteroauxin applied to soil and plants, W. F. Loehwing and L. C. Bauguess (*Science, 84 (1936), No. 2167, pp. 46, 47*).—Elongation was stimulated by the addition of 15 cc of a 1/15000 aqueous solution of β-indolyl acetic acid to the soil in pots of stock. The effect was transitory, disappearing within 10 days.

Upward effects of auxin in coleoptiles and stems, R. Snow (*New Phytol., 35 (1936), No. 4, pp. 292–304, figs. 3*).—From tests with oat coleoptiles, sunflower hypocotyls, and pea seedlings the following conclusions are drawn: Heteroauxin can be transported to some extent in the morphologically upward direction in coleoptiles, and this upward transport occurs largely, if not entirely, in the conducting strands. In whichever direction the heteroauxin is carried, it accelerates their growth. The retardation of very young internodes by heteroauxin drawn up with the transpiration stream is probably brought about in a different way from the retardation by heteroauxin paste applied externally below them. The results are discussed in detail and compared with those of other workers.

The influence of auxin on secondary branching in two species of Aster, A. L. Delisle (*Amer. Jour. Bot., 24 (1937), No. 3, pp. 159–167, figs. 12*).—The results of tests with *Aster novae-angliae* and *A. multiflorus* indicate that the differences in branching habit are largely correlated with the amount of auxin produced in the terminal bud and to a lesser extent with that produced in young leaves.

The question of the influence of humic acid on the assimilation of plants [trans. title], A. W. Blagowestschenski and A. A. Prosorowskaja (*Biochem. Ztschr., 282 (1935), No. 1–2, pp. 99–103*).—Humic acid added to a solution acted as a stimulant, increasing the permeability of the protoplasmic membrane in experiments with glucose exosmosis from onion bulb scales and with infiltration of ammonium nitrate into sunflower and sugar beet leaves. Whether or not it promotes the penetration of ammonium nitrate into the interior of the cell, under the experimental conditions it had no influence on the course of protein synthesis.

The apparent nitrogen assimilation of germinating peas. (The applicability of the Kjeldahl method to biological nitrogen assimilation experiments) [trans. title], E. M. Smyth and P. W. Wilson (*Biochem. Ztschr., 282 (1935), No. 1–2, pp. 1–25, figs. 3*).—In germinating peas in the presence of various alkaloids and salt solutions or of distilled water, increases of 0.2–0.3 percent in nitrogen content (based on dry weight) are reported. That these

increases were outside the experimental error was shown by a statistical investigation of the nitrogen content of germinated and ungerminated peas.

The Kjeldahl method and its modifications are discussed, with the conclusion that it does not appear especially suited to biological nitrogen assimilation studies.

Growth of Erysiphe germ tubes in deuterium oxide after exposure to water, R. PRATT (*Amer. Jour. Bot.*, *24* (*1937*), *No. 2, pp. 76–82, figs. 3*).—"The injury to germ tubes placed in D_2O–H_2O mixtures without earlier exposure to H_2O increased with the D_2O content of the mixture. The growth of germ tubes in *each D_2O solution varied inversely with the length* of the previous period of immersion in H_2O. The percentage rate of increase of the quotient obtained by dividing the growth that germ tubes failed to make in D_2O by the amount they would have grown if left in H_2O was constant and nearly the same in each mixture employed, but the absolute rate of increase of the quotient accompanying any period of exposure to H_2O was proportional to its value at the beginning of the exposure period. . . .

"The injury to germ tubes germinated and grown in H_2O and then transferred to different D_2O solutions was linearly related to the germ-tube length at the time of transfer. At different stages of elongation the D_2O injury to germ tubes germinated and grown in D_2O mixtures was likewise linearly related to the concentration of D_2O, and at different times throughout the growth cycle the sensitivity of germ tubes in D_2O mixtures to an increase in the D_2O concentration was nearly a linear function of their length. . . .

"Subsequent D_2O injury to germ tubes germinated and grown in D_2O mixtures was approximately a linear function of the germ-tube length during the early phases of growth, but . . . later the injury to germ tubes increased more rapidly in proportion to their length. This is interpreted to mean that before the velocity of the different reactions in the growth process becomes very great the intracellular mechanism involved can establish new equilibriums among the rates of the several spore reactions, but that later when the concentration of abnormal compounds within the spores becomes high and the reactions are proceeding rapidly, such adjustments cannot be made rapidly enough to permit growth to proceed normally."

Plants made poisonous by selenium absorbed from the soil, S. F. TRELEASE and A. L. MARTIN (*Bot. Rev.*, *2* (*1936*), *No. 7, pp. 373–396*).—This review discusses the history of livestock poisoning by selenium in plants ("alkali disease"), the cause and nature of the malady, the distribution of selenium in soils, its absorption and accumulation by plants, and control and preventive measures.

GENETICS

A chronology of genetics, R. COOK (*U. S. Dept. Agr. Yearbook 1937, pp. 169, 170, 1457–1477, fig. 1*).—The more important contributions to genetics are summarized chronologically and the development of the subject is graphically illustrated.

Fundamentals of heredity for breeders, E. N. BRESSMAN (*U. S. Dept. Agr. Yearbook 1937, pp. 166, 167, 168, 169, 1419–1449, figs. 9*).—A brief but concise explanation and summary is given of the principles of heredity in plants and animals.

Vegetative reproduction, J. R. MAGNESS (*U. S. Dept. Agr. Yearbook 1937, pp. 167, 168, 1450–1456, figs. 3*).—This is a discussion and summary of the underlying principles, the nature of mutations, and the permanency of horticultural varieties such as the Esopus Spitzenburg apple.

[The improvement of field crops] (*U. S. Dept. Agr. Yearbook 1937, pp. 132, 133, 150–156, 395–444, 999–1214, figs. 79*).—The articles included in the above paging are entitled Popcorn Breeding, by A. M. Brunson (pp. 395–404); Breeding and Genetics in Potato Improvement, by F. J. Stevenson and C. F. Clark (pp. 405–444); Miscellaneous Forage and Cover Crop Legumes, by R. McKee and A. J. Pieters (pp. 999–1031); Breeding Miscellaneous Grasses, by H. N. Vinall and M. A. Hein (pp. 1032–1102); Improvement of Timothy, by M. W. Evans (pp. 1103–1121); Alfalfa Improvement, by H. M. Tysdal and H. L. Westover (pp. 1122–1153); Improvement in Soybeans, by W. J. Morse and J. L. Cartter (pp. 1154–1189); and Clover Improvement, by A. J. Pieters and E. A. Hollowell (pp. 1190–1214). Summaries are also included (pp. 132, 133, 150–156).

As in the previous group (E. S. R., 76, p. 26), the articles for the specific crops indicated variously review the history and status of improvement in the United States and elsewhere; describe improvement methods and objectives; indicate varieties and strains improved by introduction, selection, or hybridization by State experiment stations, the U. S. Department of Agriculture, and other agencies and individuals; treat of the work and productions of breeders in foreign countries; record progress and accomplishments in genetic and cytological work with the crop; cite pertinent literature; and list recommended varieties and personnel engaged in research in different States and countries, indicating their current work and objectives.

The inheritance of various morphological characters in alfalfa and their relation to plant yields in New Jersey, G. W. Burton (*New Jersey Stas. Bul. 628 (1937), pp. 35, figs. 6*).—The principal conclusions from the inheritance and field studies with alfalfa, here reported in greater detail, have been noted from another source (E. S. R., 77, p. 766). Other pertinent observations are as follows:

An alfalfa variety for New Jersey should be resistant to wilt (*Phytomonas insidiosa*) and to heaving injury, two of the most common causes of loss of stand. Soil texture and drainage evidently are important factors determining longevity of alfalfa stands in the State. Indications were that soil drainage, available nutrients, and pH play an important role in alfalfa seed production in the Eastern States.

In general, the relationship between plant characters as measured by correlation ratios was similar in type and degree under field and greenhouse conditions. High positive linear correlations, in the greenhouse and field, between green and dry plant weights seemed to justify the determination of only green weights when choosing superior plants within a plant progeny. The amount of water transpired by alfalfa tended to be directly proportional to the dry weight of the plant. Three harvests should be considered a minimum for determining the relative yield capacity of an alfalfa progeny, particularly if the plants have been transplanted from the greenhouse to the field. In field planting of F_3 of *Medicago falcata* × Hardigan, winter survival seemed to be associated with frost resistance and a well-branched root system, the most resistant plants possessing the most highly branched root system.

Variation in buffalo grass, W. B. Gernert (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 242–246, figs. 4*).—Several variants in *Buchloe dactyloides* are described from Oklahoma Experiment Station studies.

A genetical study of roots in relation to disease-resistance in cotton, V. G. Panse and A. F. Patel (*Indian Jour. Agr. Sci., 7 (1937), No. 3, pp. 451–457*).—A long taproot, many laterals in the lower regions, and a few laterals in the upper region were associated with greater resistance of certain varieties

to root rot. Similar differences were shown to exist between resistant and unselected plants within Broach 9 cotton. Such differences within a strain evidently justify single plant selection based on desirable root characters. A rapid method of exposing and examining cotton roots is described.

The chromosome number in Ipomoea and related genera, J. R. King and R. Bamford (*Jour. Heredity, 28 (1937), No. 8, pp. 278–282, fig. 1*).—Most of the species and varieties of *Ipomoea* and several related genera studied at the Maryland Experiment Station were found to be diploids ($2n=30$) except *I. ramoni* ($2n=60$) and *I. batatas* ($2n=90$). The basic chromosome number in *Quamoclit* varies in different species, being either 14 or 15. Certain reported hybrids are discussed in relation to the chromosome numbers for the species in both groups.

Inheritance of height of plants in the Italian millet—Setaria italica (Beauv.), G. N. R. Ayyangar and P. V. Hariharan (*Madras Agr. Jour., 25 (1937), No. 5, pp. 141–143, pl. 1*).—In *S. italica*, tall plant averaging about 111 cm in height proved a simple dominant to short plant, average 75 cm. Both parents had about the same number of internodes but differed in internodal length, which also affected the length, thickness, and weight of the main head with corresponding increases in kernel number and weight.

Breeding winter oats resistant to crown rust, smut, and cold, H. C. Murphy, T. R. Stanton, and H. Stevens (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, p. 622–637*).—Strains of hardier types of winter oats resistant to smut and crown rust were the objective in cooperative work by the U. S. D. A. Bureau of Plant Industry and the Iowa and Idaho Experiment Stations.

Results on the reaction of selections from Lee × Victoria and Hairy Culberson × Victoria oats crosses to cold (freezing), crown rust, and smut under greenhouse, laboratory, and field conditions are presented for the F_2 to F_6 generations. Forty-seven of about 600 F_2 plants marked as showing a tendency toward winter habit in the seedling stage were used as foundation stocks. A tendency expressed for transgressive segregation in cold resistance in Lee × Victoria, not evident in Hairy Culberson × Victoria, was confirmed. Under freezing-chamber conditions in the F_5 generation, 37 of 87 selections of Lee × Victoria surpassed Lee in cold resistance.

Distribution of F_3 plants on the basis of reaction to crown rust under greenhouse conditions suggested a genetic ratio of 1:2:1 in F_2 for resistance, heterozygosity, and susceptibility. Most F_4 families of both crosses showed satisfactory resistance to crown rust. Fairly close agreement in resistance to crown rust was obtained in sister progenies grown simultaneously in greenhouses at Ames, Iowa, and Arlington, Va., the data also supporting the view that in most cases resistance to crown rust in the seedling stage is analogous to that of the adult stage. Smut occurred in only two F_4 families of Lee × Victoria and in none of Hairy Culberson × Victoria. Of 123 selections of both crosses tested in F_5, 77 were resistant to smut at both Aberdeen, Idaho, and Arlington, Va. Under field conditions at Aberdeen in 1936, smutted plants appeared in 6 of 33 F_6 progenies, many plants from the smut-free and crown-rust resistant families being promising in grain characters.

Inheritance of rest period of seeds and certain other characters in the peanut, F. H. Hull (*Florida Sta. Bul. 314 (1937), pp. 46, figs. 2*).—Genetic studies of the required rest period of seeds, seed shape, seed coat color, yellow seedlings, Valencia plant type, and a brachytic form of dwarfing in the common peanut (*Arachis hypogaea*) are reported, and biometric tests for associations of the first 5 of these characters among themselves and with 17 others also are presented. A division of the American varieties of *A. hypogaea* into

three principal groups—runner, Spanish, and Valencia—was proposed and used in the study.

Seeds planted soon after maturity in conditions near optimum for germination often required rest periods ranging up to 2 yr. before germinating. Rest periods seemed due to necessary physical or chemical changes within the seeds, i. e., after-ripening. The average time to emergence of different strains of Spanish and Valencia peanuts ranged from 9 to 50 days, and in a more dormant group including runner peanuts, *A. nambyquarae*, and *A. rasteiro*, from 110 to 210 days. Genetic differences between strains within the two groups appeared to be very probable.

The mean time to emergence of F_1 seeds was intermediate and probably slightly greater than the parental average, whereas means of later generation hybrids were considerably below the midpoint of their parents. Marked transgressive segregation of F_2 families above the greater parents was found in four crosses of Spanish and runner peanuts. Rest period behavior suggested and agreed closely with a theory of multigenic inheritance with the zero point of rest period coinciding with a germination threshold lying near the midpoint of the range of the seed condition basic to rest period.

A single pair of major genes differentiating long and short seeds with the heterozygote intermediate was demonstrated in crosses of Spanish and runner peanuts, seed shape evidently being controlled largely by maternal impression and little by the genotype of the seed. Russet seed coat color of runner peanuts behaved as a single dominant to tan color of Spanish peanuts. Yellow seedlings appearing among progenies of a number of crosses indicated duplicate gene inheritance with green fully dominant. The genotypes $L_1L_1l_2l_2$ might be assigned to the Spanish group, $l_1l_1L_2L_2$ to the runner group and *A. nambyquarae*, and $L_1L_1L_2L_2$ to the Valencia group and *A. rasteiro*. Deficiencies of recessive zygotes were found in both monohybrid and dihybrid progenies in all crosses, and in some cases deficiencies of segregating plants in proportion to true breeding dominants also were found. The Valencia plant type (sparse branching and central stem in the fruit cluster), found among progenies of several crosses of Spanish and runner strains, behaved as a duplicate gene recessive, indicating that the parent groups carry alternate pairs of duplicate genes in recessive and dominant conditions. Male-sterile, brachytic, dwarf plants, discovered in an F_3 family of Virginia Runner × Tennessee Red, behaved as a monogenic recessive.

Regression tests involving 22 characters as dependent variables and rest period of seeds, seed shape, seed coat color, yellow seedlings, and Valencia plant type as independent variables, made with F_2 plants or families in four crosses of Spanish and runner peanuts, revealed no significant regressions.

The inheritance and use of phenol colour reaction in hard red spring wheats, J. G. C. Fraser and F. Gfeller (*Sci. Agr., 17 (1936), No. 4, pp. 243–249; Fr. abs., p. 249*).—Six spring wheats, harvested at 2-day intervals from soft dough to maturity and treated with a 1 percent phenol solution, gave intensified reactions as they approached maturity and increased in dry matter content. The kernels, spikes, and floral parts were all influenced by the maturity of the plants. The respective color reactions at maturity were for kernels and floral parts of Canus, brown, brown; Garnet, dark brown, colorless; Marquis, dark brown, dark brown; Red Fife, pale brown, brown; Reward strains, dark brown, dark brown and brown; and Ruby, pale brown, brown. Possible explanations of the inheritance of phenol color reactions of spike and kernel in Garnet×Red Fife wheat were allelomorphic factors, or two completely linked factors.

Emasculation of wheat by chilling, C. A. SUNESON (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 247–249*).—Mass production of wheat hybrids by emasculation with low temperatures, accomplished at the Nebraska Experiment Station with the U. S. Department of Agriculture cooperating, was made possible by differences in resistance of stamens and pistils to cold during a short period before heading.

[The improvement and genetics of vegetables] (*U. S. Dept. Agr. Yearbook 1937, pp. 122–132, 171–394, figs. 29*).—Preceded by a brief summary (pp. 122–132), the following papers include accounts of the historical development, present status, and future trends of breeding and genetic studies with vegetables: Vegetable Crop Breeding and Improvement—An Introduction (pp. 171–175), and Improvement and Genetics of Tomatoes, Peppers, and Eggplant (pp. 176–206), both by V. R. Boswell; Breeding and Improvement of Cucurbits, by T. W. Whitaker and I. C. Jagger (pp. 207–232); Onion Improvement, by H. A. Jones (pp. 233–250); Breeding and Improvement of Peas and Beans, by B. L. Wade (pp. 251–282); Improvement in the Leafy Cruciferous Vegetables, by R. Magruder (pp. 283–299); Improving the Root Vegetables, by C. F. Poole (pp. 300–325); Improvement of Salad Crops, by R. C. Thompson (pp. 326–339); Improvement of Vegetable Crops—Appendix, by V. R. Boswell (pp. 340–378); and Improvement of Sweet Corn, by C. F. Poole (pp. 379–394).

Varietal improvement in hops, D. C. SMITH (*U. S. Dept. Agr. Yearbook 1937, pp. 156, 157, 1215–1241, figs. 7*).—Tracing briefly the origin and development of hops and their use in the manufacture of beverages, the author discusses the problems involved in hop breeding and improvement, with a summary of activities to the present time. A brief summary is included of the paper (pp. 156, 157).

[The improvement and genetics of fruits and nuts] (*U. S. Dept. Agr. Yearbook 1937, pp. 133–149, 445–889, figs. 122*).—Preceded by a brief summary (pp. 133–149), the papers included present accounts of the historical development, present status, and future trends of breeding and genetic studies, as follows: Strawberry Improvement (pp. 445–495), Blackberry and Raspberry Improvement (pp. 496–533), and Improvement of Currants and Gooseberries (pp. 534–544), all by G. M. Darrow; Some Unusual Opportunities in Plant Breeding, by G. M. Darrow and G. E. Yerkes (pp. 545–558); Improving the Wild Blueberry, by F. V. Coville (pp. 559–574); Progress in Apple Improvement (pp. 575–614), and Progress in Pear Improvement (pp. 615–630), both by J. R. Magness; Grape Development and Improvement, by E. Snyder (pp. 631–664); Improvement of Stone Fruits, by F. P. Cullinan (pp. 665–748); Improvement of Subtropical Fruit Crops—Citrus, by H. P. Traub and T. R. Robinson (pp. 749–826); and Nut Breeding, by H. L. Crane, C. A. Reed, and M. N. Wood (pp. 827–889).

Polyploidy in native species of Malus, F. B. LINCOLN and L. P. MCCANN (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 26*).—An examination at the University of Maryland of the root tip cells of seedlings of various species of *Malus* showed 68, 34, 34, 68, 68, 51, 68, and 51 chromosomes in *M. platycarpa*, *M. ioensis*, *M. angustifolia*, *M. glaucescens*, *M. glabrata*, *M. lancifolia*, *M. coronaria*, and *M. bracteata*, respectively.

Improvement of flowers by breeding, S. L. EMSWELLER, P. BRIERLEY, D. V. LUMSDEN, and F. L. MULFORD (*U. S. Dept. Agr. Yearbook 1937, pp. 149, 150, 890–998, figs. 25*).—This paper and brief summary present concise, comprehensive accounts of the historical development, present status, and future trends of breeding and genetic studies.

[Genetic research with violets] (*Vermont Sta. Bul. 425 (1937), pp. 28–30*).—Included are brief reports on chromosomal structure, embryo development, and limits of hybridization.

Improvement of forest trees, E. J. SCHREINER (*U. S. Dept. Agr. Yearbook 1937, pp. 158, 159, 1242–1279, figs. 14*).—Stating that breeding of forest species is still largely an unexplored field, the author reviews the somewhat limited progress to date, discusses the technic employed, and suggests profitable lines of improvement. A brief summary is also included.

Investigations of sexuality in Tilletia tritici with reference to breeding for immunity [trans. title], T. BECKER (*Phytopath. Ztschr., 9 (1936), No. 2, pp. 187–228, figs. 8*).—Following a review of previous work on the race and sexuality problem, the author discusses the isolation and behavior of monosporidial lines of *T. tritici* on artificial media, its sexuality relations (including methods of mycelial infection, the results of infection, and their value in elucidating sexuality relations), and the inheritance of aggressiveness and growth behavior in monosporidial lines. A bibliography of 40 titles is included.

[Papers on progress in animal genetics] (*U. S. Dept. Agr. Yearbook 1937, pp. 159–166, 1280–1418, figs. 45*).—Preceded by a brief summary (pp. 159–166), accounts are given as follows: Breeding Problems With Angora Goats, by W. V. Lambert (pp. 1280–1293); Improvement of Milk Goats, by V. L. Simmons and W. V. Lambert (pp. 1294–1313); Heredity in the Dog, by W. M. Dawson (pp. 1314–1349); The Breeding of Turkeys, by S. J. Marsden and C. W. Knox (pp. 1350–1366); Duck Breeding, by A. R. Lee (pp. 1367–1378); The Breeding of Fur Animals, by F. G. Ashbrook (pp. 1379–1395); and Bee Breeding, by W. J. Nolan (pp. 1396–1418).

On the inheritance of biochemical characters by animals and its relation to their growth, I, II, V. I. PATRUŠEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 14 (1937), No. 9, pp. 573–584, figs. 2*).—Two papers are presented.

I. *Glutathion concentration in the blood and difference in size of breeds of farm animals.*—Investigations of the glutathion in the blood of calves and mature cattle and sheep of different breeds and crosses showed that the differences between the breeds were statistically significant, and glutathion content in the blood is therefore suggested as a hereditary character which is correlated with mature weight and rate of attaining maturity. Variability in regard to glutathion concentration was associated with age, rate of growth, time of day, and time of feeding. The low concentration of glutathion seemed to be dominant in crosses.

II. *The catalase content in the blood of horned cattle and of sheep.*—Variations in the catalase content in the blood of cattle and sheep were associated with age, time of day, and other factors considered in connection with the above paper. The results confirmed other suggestions regarding the inheritance of catalase content and showed that catalase was correlated with temperament and body size.

Color inheritance in Shorthorn cattle, E. ROBERTS (*Jour. Heredity, 28 (1937), No. 5, pp. 167, 168*).—An analysis of the color inheritance, based on 818 Shorthorn progeny in the Illinois Experiment Station herd and their parents and grandparents, showed that the data on red and white fitted very closely the hypothesis that reds were *RR*, roans *Rr*, and whites *rr*, with red and whites exhibiting recessive spotting. Attention is called to the fact that this hypothesis does not hold in crosses of white Shorthorns with black breeds, although it serves to explain the colors in the cattle produced in the Shorthorn herd of the Illinois Experiment Station with one exception, based on herd book records, in which a red and a red and white produced a roan individual.

Practical proving of dairy sires, R. B. BECKER and P. T. D. ARNOLD (*Amer. Dairy Sci. Assoc., South Div., Ann. Mtg., 1937, Abs. Papers, pp. 19, 20*).—A study of the milk and fat production of dams and their daughters by seven bulls in the Florida Experiment Station herd showed differences in the transmitting ability of the sires, but none produced daughters whose records were all above their dams. There was a tendency for the daughters of the highest producing dams to produce smaller amounts of milk and fat than their dams.

The dam as a transmitter, P. T. D. ARNOLD and R. B. BECKER (*Amer. Dairy Sci. Assoc., South. Div., Ann. Mtg., 1937, Abs. Papers, pp. 17, 18*).—An analysis of 82 daughter-dam comparisons of milk and butterfat records in the Florida Experiment Station herd showed a small but positive tendency ($r=0.16$) for daughters from higher producing dams to yield more milk than the average of those from medium and low producing dams.

Investigations on the inheritance of duration of pregnancy, birth weights, and teat number in swine [trans. title], J. SCHMIDT, E. LAUPRECHT, and H. STAUBESAND (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 1, pp. 55–100, figs. 10*).—In 337 litters produced by several breeds the average duration of pregnancy varied from 112 to 115 days, but no relation could be found between the gestation period, the size of litters, or the season of the year. However, crossing the domestic breeds with wild swine increased the average gestation period from 2 to 4 days. Some indications of family differences in the duration of gestation were evident.

Variations in the average birth weights of pigs of the different breeds were noted, but they showed no consistent relation to size of litter, duration of pregnancy, or time of year when born. The birth weights of cross-bred pigs were intermediate between those of their parents. Variations in the birth weights between different breeds and families were evidently hereditary.

The number of teats showing the greatest frequency in the 2,694 animals observed was 6 on each side, but variations in the number on both sides of the body were observed. In crosses, it was evident that teat number behaved as a hereditary character. The results of mating sows and boars with different numbers of teats showed that if both parents had at least 14 teats 90 percent of the progeny had 12 or more teats.

A further contribution to the occurrence of monozygotic twins in swine [trans. title], P. COHRS (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 3, pp. 295–305, figs. 4*).—Continuing studies on monozygotic twins in swine,[2] two intra-uterine cases are described. In one pair there was only partial separation, resulting in an abnormal monster. Both the others were in the same embryonic membranes, but one was being resorbed.

The segmentary structure of the human X-chromosome compared with that of rodents, K. OGUMA (*Jour. Morph., 61 (1937), No. 1, pp. 59–93, pls. 3, figs. 6*).—From studies of the chromosomes observed in the testes of three Manchurian men, the author reports that the X chromosome consists of three segments and that no Y chromosome is present in men. One segment, being larger than the rest, has been confused with the Y chromosome. Attention is called to the fact that the X chromosome of rodents exhibits similar constrictions. The number of chromosomes in human spermatogonia was clearly counted as 47.

An analysis of hen feathering in the Sebright Bantam fowl and other breeds [trans. title], J. KŘÍŽENECKÝ (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 31 (1934), No. 2, pp. 201–216, figs. 6*).—An account is given of a pair of Sebright Bantams in which the secondary sex characteristics of the hen

[2] Berlin. Tierärztl. Wchnschr., 50 (1934), No. 49, pp. 641–645, figs. 5.

changed spontaneously to those of a cock. On dissection, the gonads were found to consist of two well-developed testicles.

Turkey-chicken hybrids, J. P. Quinn, W. H. Burrows, and T. C. Byerly (*Jour. Heredity, 28 (1937), No. 5, pp. 169–173, figs. 3*).—This more detailed account of the attempts to cross turkeys and chickens by artificial insemination in the U. S. D. A. Bureau of Animal Industry (E. S. R., 76, p. 612) notes that about 20 percent fertility was obtained when turkey hens were inseminated with semen from Rhode Island Red, White Wyandotte, and cross-bred cockerels. All of the embryos died by the sixth day of incubation except one, which lived until fully developed and ready to hatch. The conformation of this hybrid was intermediate between the chicken and the turkey. The comb, down color, and shank color resembled the chicken. A tendency to extra toes was also noted. Only 0.76 percent fertility was obtained in the reciprocal cross.

Heritable color variations in the Mexican swordtail-fish, M. Gordon (*Jour. Heredity, 28 (1937), No. 6, pp. 222–230, figs. 2*).—Studies of the inheritance of contrasting characters, stippled and gold and crescent and twin-spot, in swordtail fish showed the stippled effect to be dominant to nonstipple or gold. Two pairs of factors determine twin-spot and crescent. $C\ P$ individuals are crescent, and $C\ p$ twin-spot, whereas $c\ P$ and $c\ p$ are neither crescent nor twin-spot. An alternative hypothesis is also presented.

[**Studies on the physiology of reproduction and lactation**] (*Missouri Sta. Bul. 387 (1937), pp. 30, 31, 42, 43, 49, 51, 52*).—In addition to studies previously reported, brief comments are given on the following subjects: Duration of the sexual cycle and time of optimum breeding in mares, by A. E. Trowbridge and H. C. Moffett; chemical analysis of lactogenic hormone extracts prepared by the acetic acid and acid-acetone methods, by W. H. McShan; variations in the galactin content of cattle pituitaries powdered after freezing as related to sex, age, weight, breed, length of gestation, and stage of lactation, by C. W. Turner and R. P. Reece; and the effects of irradiation in preventing proliferation of the secretory tissue of the mammary glands of rabbits, by Turner and E. T. Gomez.

The reproductive capacity of rams, F. F. McKenzie and V. Berliner (*Missouri Sta. Res. Bul. 265 (1937), pp. 143, figs. 53*).—Seasonal and individual variations in sperm production were measured on eight Shropshire and eight Hampshire rams after permitting them to mate at will. Wide variations were observed in the numbers of sperm produced, but these were not associated with the mating desire, although seasonal effects and excessive breeding activities influenced the number of sperm per ejaculation. Increased numbers of abnormal sperm were found during the hot season. During the breeding season, no effect of continuous services on sperm morphology could be detected. Semen from normal rams was slightly acid and contained from 3 to 5 million sperm per cubic millimeter with a marked drop after the third or fourth ejaculation on the same day. Much variability was observed in the number of possible matings and the sperm concentration in subsequent matings.

Fusion of the embryonic membranes and intersexuality in domestic swine [trans. title], P. Cohrs (*Ztschr. Anat. u. Entwickl. Gesch., 102 (1934), No. 5, pp. 584–593, figs. 3*).—Four litters of pig embryos are described. In each of these litters, two of the fetuses were in a single chorion but each had separate allantoic membranes although the blood vessels were anastomosed. The twins described are considered to be of dizygotic origin, and in cases where the sexes were dissimilar on differentiation the females would be expected to exhibit intersexuality.

Hormonal factors involved in parturition in the rat, F. E. D'Amour and C. Dumont (*Quart. Jour. Expt. Physiol., 26 (1937), No. 3, pp. 215–224, fig. 1*).—In experiments dealing with factors responsible for parturition in rats, animals were injected during, but near the end of, gestation. It was found that large doses of oestrin, with and without gonadotropic substances, terminated gestation by killing the fetuses or interfering with parturition. No support was given to any of the theories regarding the role of oestrin, pitocin, or extracts of the anterior lobe, placenta, follicular fluid, or blood in inducing parturition.

The effects of Δ^4-androstenedione and Δ^5-androstenediol on castrated and ovariectomized rats, V. Korenchevsky, M. Dennison, and M. Eldridge (*Biochem. Jour., 31 (1937), No. 3, pp. 467–474*).—Both Δ^4-androstenedione and Δ^5-androstenediol, synthetic sex hormones, were found to stimulate male and female sex activities in normal and gonadectomized male and female rats. Some cooperative activity was shown between androstenedione and oestrone in the female, but not in the male, and there was evidence of an antagonistic effect of oestrone on the action of androstenediol on some of the female sex organs. The effects of these hormones on other glands, fat deposition, and body weight are discussed.

The physiology of pregnancy in the rat: The combined action of male and female hormones (testosterone propionate and oestrone), A. M. Hain (*Quart. Jour. Expt. Physiol., 26 (1937), No. 3, pp. 293–298*).—Injection of a dose of oestrone, found to produce cornification in half of the ovariectomized rats injected, produced cornification in only 2 of 40 rats when injected simultaneously with testosterone propionate. Notwithstanding the antagonistic action of the male and female hormones in the ovariectomized animal, male hormone in small, medium, or large quantities was unable to override the action of oestrone in interrupting pregnancy when administered at the eleventh or twelfth day of gestation. Other tests showed that testosterone alone caused abortion, but it could not bring about cornification in ovariectomized rats. The action of male hormone in interrupting pregnancy was therefore considered specific.

The prolonged treatment of castrated and ovariectomized rats with testosterone propionate, V. Korenchevsky, M. Dennison, and M. Eldridge (*Biochem. Jour., 31 (1937), No. 3, pp. 475–485*).—Testosterone propionate was found to be more effective than testosterone in bringing about complete recovery of atrophied sex organs of castrated males and the weight of the cervix in spayed female rats. The effects on other organs in gonadectomized males and females are noted. Testosterone propionate was more effective than testosterone in these respects.

FIELD CROPS

Factorial design, A. E. Brandt (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 658–667, fig. 1*).—This contribution from Iowa State College aims to show that, if properly designed, as an experiment is made more complex it becomes more efficient and more widely applicable; and to show that a design, in which two or more factors or elements each at two or more levels are investigated in all combinations in the same experiment, will attain the desired ends. Such a design is known as a factorial design. Advantages of factorial experiments include efficiency, comprehensiveness, applicability, and economy.

[Agronomic research in the Southern States] (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 11–14, 14–19, 22–26, 35, 36, 50–52, 53–78, 124, 125, 130–132, 161–166, 172–176, 186, 194–199, 200–202, 204–208, 230, 266–271*).—The several papers dealing with agronomic problems and presented at the conven-

tion of the Association of Southern Agricultural Workers at Jackson, Miss., February 5–7, 1936, reported largely in abstract form, included Sixteen Years' Experience With Pastures in the Coastal Plain of Georgia, by J. R. Fain (pp. 11–14), A Survey of the Varieties of Cotton Grown in Georgia in 1935, by E. C. Westbrook (pp. 54, 55), and The Effect of Variety, Planting Date, Spacing, and Seed Treatment on Cotton Yields and Stands, by G. A. Hale (pp. 58, 59) (all Ga.); A Summary of Three Years' Results of Pasturing Bermuda Grass With Milking Cows, by E. C. Elting and J. P. LaMaster (pp. 14, 15), and Response of the Cotton Plant to Various Sources of Nitrogen Fertilizers on Unlimed and Limed Soil, by W. R. Paden (p. 61) (both S. C.); Comparison of Northern and Southern Pasture Grasses, Particularly as to Their Composition and the Effect of Fertilizer Applications on This Factor, by H. N. Vinall and H. L. Wilkins (pp. 15, 16), A Comparison of the Hohenheim System With Ordinary Methods of Pasture Management, by T. E. Woodward and M. A. Hein (pp. 17, 18), Soil Conservation Program in the Southeastern States, by T. S. Buie (pp. 22, 23), Some Phases of Vegetative Control in the Soil Conservation Program, by E. Carnes (pp. 23, 24), Terracing Machinery and Terrace Construction Practices, by R. W. Baird (pp. 24, 25), The Relation of Pasture Management to Soil Conservation, by R. E. Penn (pp. 25, 26), Tillage Experiments Upon Greenville Sandy Loam Soil, by J. W. Randolph (pp. 35, 36), Some Notes on the Origin of Cotton Varieties in the United States, by J. O. Ware (pp. 55, 56), Relationships of the Cultivated and Wild Cottons of the World, by T. H. Kearney (pp. 56, 57), Composition of the Cotton Plant as Related to Fertility Factors in Texas Black-Land Soils, by E. R. Collins and D. R. Ergle (pp. 59, 60), Analyses of Variance as Applied to the Regional Cotton Variety Study, by O. A. Pope and J. O. Ware (p. 60), Soybean Varieties and Their Utilization, by W. J. Morse (pp. 64, 65), Variety Tests of Sugarcane in the Southern United States, by G. Arceneaux (p. 65), *Lespedeza sericea:* What We Know About the Crop Today, by A. J. Pieters (p. 66), Alfalfa Investigations in the Mississippi Delta, by P. R. Henson (p. 67), Flue-Cured Tobacco Varieties, by E. G. Moss (pp. 67, 68), The Present Status of Crotalaria in the United States, by R. McKee (pp. 68, 69), Mineral Nutritional Deficiency Effects in Tobacco, by J. E. McMurtrey, Jr. (pp. 72, 73), Fertilization of Plant Cane on Some of the More Important Soils of the Sugarcane District of Louisiana, by A. M. O'Neal and L. A. Hurst (p. 75), The Zinc Content of Soils, Soil Reaction and Rosette of Pecans, by H. M. Boggs and A. O. Alben (p. 76), and Progress of the Soil Survey in the Southern States, by W. E. Hearn (pp. 77, 78) (all U. S. D. A.); Contributions of Plant Breeding to an Improved Agriculture, by H. B. Brown (pp. 53, 54), Notes on the Appearance and Behavior of a Peculiar New Strain of Cotton, by J. R. Cotton (pp. 57, 58), Cotton Following Winter Legumes in Louisiana, by C. B. Haddon (pp. 62, 63), Relation of Fertilizer Ratios to Available Nutrients and Base Saturation in Louisiana Soils, by H. C. Lovett and J. F. Reed (pp. 73, 74), and Toxicity From Arsenic Compounds to Rice on Flooded Soils, by J. F. Reed and M. B. Sturgis (p. 76) (all La.); Studies in Sedge Grass Control, by L. R. Neel (pp. 18, 19) (Tenn.); Requirements for an Improved Agriculture, by O. C. Bryan (p. 50) (Fla.); What Kind of a Land Policy Shall We Have in the South? by C. P. Blackwell (pp. 50, 51), Crop Production on Some Oklahoma Soil Profiles, by H. F. Murphy (pp. 63, 64), and A Five-Year Summary of Fertilizer Results on Sweet Potatoes, by E. F. Burk (pp. 124, 125) (all Okla.); Soil Conservation in an Improved Agriculture, by M. F. Miller (pp. 51, 52) (Mo.); One-Variety Community Cotton Production in Georgia, by E. C. Westbrook, R. P. Bledsoe, and C. A. McLendon (p. 56) (Ga. and U. S. D. A.); The Practical Side of Fertilizer Application

Investigations, by H. R. Smalley (pp. 69–71); Fertilizer Placements in Connection With Seed Bed Preparation for Cotton, by R. Kuykendall (p. 71), and Phosphorus Requirements for Certain Mississippi Soils, by C. R. Dorman (pp 74, 75) (both Miss.); the Influence of Handling Seed Stock on the Shrinkage Plant Production and Yield of the Triumph Sweet Potato, by W. S. Anderson and J. B. Edmond (pp. 130–132) (Miss. and S. C.); The Effect of Lime on the Soil and Plant Composition, by J. A. Naftel (pp. 71, 72) (Ala.); and Copper Sulfate as a Plant Nutrient and Soil Amendment, by W. L. Churchman, R. Russell, and T. F. Manns (p. 77) (Del.).

The following papers were presented at the convention held in Nashville, Tenn., February 3-5, 1937: Methods of Pasture Research, by M. A. Hein (pp. 161, 162), Pasturing Woodland in Relation to Southern Forestry, by W. G. Wahlenberg (pp. 165, 166), The Interest and Responsibility of Agriculture in the Protection of Streamflow, by C. R. Hursh (pp. 172–174), Meadow Strips, by A. H. Veazey (pp. 174, 175), The Place of Kudzu in Southern Agriculture, by R. Y. Bailey (pp. 175, 176). The Relation of Soil and Water Conservation to a Land-Use Policy for the South, by H. V. Geib (p. 186), Character of Present Soil Survey and Land Classification Work in the Tennessee Valley, by J. W. Moon (p. 202), The Place of Legumes in a Soil Conservation Program, by T. S. Buie (pp. 204, 205), Extent of Improved Varieties of Cotton in the United States, by J. O. Ware (pp. 206, 207), Recent Genetic and Breeding Studies in Cotton, by J. W. Neely (p. 207), and A Study of Certain Phases of a Regional Study of Cotton Varieties, by O. A. Pope (pp. 207, 208) (all U. S. D. A.); The Place of Livestock Production in Southern Agriculture, by E. W. Sheets (pp. 162, 163), Comparative Nitrogen Content of Several Legumes Grown on Different Soils, by I. E. Miles (p. 195), and Influence of Size of Seed Upon Plant Production and Yield of the Triumph Sweet Potato (pp. 269, 270) and The Influence of Size of Plant on Yield of the Triumph Sweet Potato (p. 270), both by W. S. Anderson (all Miss.); Soils and Soil Treatments in Pasture Production, by H. P. Ogden (p. 163), and Comparison of Neubauer and Fungus Methods for Determining the Fertilizer Requirements of Soils, by C. A. Mooers (pp. 194, 195) (both Tenn.); Pasture as a Source of Balanced Feed for Livestock, by R. H. Lush (pp. 163, 164), A Survey of Published and Unpublished Data on Fertilizers for Cotton and Corn, by F. L. Davis (pp. 197, 198), Registration of Cotton Varieties Object and Hindrance, by H. B. Brown (p. 205), Pasture Fertilization Results, by R. H. Lush (p. 230), The Effect of High Storage Temperature Upon Fall-Grown Seed Irish Potatoes, by J. C. Miller, W. D. Kimbrough, and J. G. Richard (p. 267), The Marketing and Distribution of Louisiana Porto Rico Sweet Potatoes, by J. C. Miller and P. T. Ecton (pp. 267, 268), and Community Treating of Seed Potatoes for Scab and *Rhizoctonia*, by J. G. Richard (pp. 270, 271) (all La.); Pasture Mixtures, by E. N. Fergus (p. 165) (Ky.); Relative Efficiency of Inorganic and Organic Sources of Nitrogen Fertilizers for the Major Crops (pp. 195, 196) and Comparison Between Results of Electrodialysis and Certain Rapid Test Methods for Determination of Available Plant Food in Soils (p. 201), both by W. R. Paden, and Some Results on Sprout Production on the Porto Rico Sweet Potato, by J. B. Edmond (pp. 268, 269) (all S. C.); Secondary Effects of Fertilizers, by L. G. Willis (pp. 196, 197) (N. C.); Some Fertilizer Problems in the Southern States, by F. E. Bear (pp. 198, 199); Adapting High Analysis and Concentrated Fertilizers to Cotton Soils, by J. J. Skinner, H. B. Mann, E. R. Collins, E. T. Batten, and R. P. Bledsoe (pp. 200, 201) (U. S. D. A., N. C., Va., Ga.,); and The Interrelation of Size of Seed Piece, Spacing of Seed Piece, and Rate of Application of Fertilizer in the Production of Irish Potatoes in Alabama, by L. M. Ware (p. 266) (Ala.).

[Field crops research in Illinois], W. L. Burlison, J. C. Hackleman, O. H. Sears, C. M. Woodworth, L. E. Allison, J. J. Pieper, W. P. Flint, B. Koehler, G. H. Dungan, W. J. Mumm, A. L. Lang, J. R. Holbert, J. H. Bigger, D. C. Wimer, E. E. DeTurk, E. B. Earley, D. A. Coleman, E. W. Lehman, R. H. Reed, C. A. Van Doren, O. T. Bonnett, L. V. Sherwood, M. J. Dorsey, C. W. Veach and D. T. Englis (*Illinois Sta. Rpt. 1936, pp. 28–49, 53, 54, 55–65, figs. 8*).—Investigations with field crops reported on briefly in these pages (E. S. R., 77, p. 324) dealt with variety trials with corn (and corn hybrids), winter and spring wheat, oats, barley, buckwheat, grain sorghum, alfalfa, red clover (strains), lespedeza, soybeans, seed flax, and miscellaneous grasses and clovers and combinations of pasture and forage plants; breeding work with corn for oil and protein content and with wheat, oats, Jerusalem-artichokes, and soybeans; the merits of Brill, a new winter wheat selected from Turkey by Koehler; improvement of corn by top-crossing and by reconstitution; reduction of losses from ear rots by resistant corn hybrids; resistance of corn hybrids to *Diplodia* stalk rot as related to carbohydrates, relative yields of crown-injured v. normal kernels, response to seed treatments, and effects of storage, all with seed corn; the inheritance of seed and leaf characters in soybeans; variations in Kentucky bluegrass and redtop; cultural (including planting) tests with red clover and other clovers; nurse crop and cutting tests with red clover; studies of the shrinkage of hay to improve storage methods; fertility value of cornstalk ash and residues, and growing soybeans, both for soil improvement purposes; studies of the factors influencing the nodulation of legumes; comparison of types of inoculants; tests of chlorates and other chemicals for poison-ivy, Canada thistle, and quackgrass; surveys of infestation and chemical control with bindweed and studies of its development, preliminary phases of an extensive project; life history and control studies with wild garlic and onions; and production studies with crops relatively new in the State, including pyrethrum, artichokes, grain sorghum, buckwheat, and flax. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Missouri], W. C. Etheridge, B. M. King, C. A. Helm, L. J. Stadler, G. F. Sprague, J. M. Poehlman, E. M. Brown, T. J. Talbert, and R. A. Schroeder (*Missouri Sta. Bul. 387 (1937), pp. 62–68, 78, 79*).—Brief progress reports (E. S. R., 76, p. 618) are made from breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; genetic studies with corn, concerned chiefly with production of genetic variations by radiation of pollen with ultraviolet rays and the mechanism of gene rearrangement induced by X-ray treatment (E. S. R., 77, p. 31); variety trials with corn, wheat, barley, soybeans, oats, and cotton; treatments to break dormancy of spring-grown potatoes for fall planting; fertilizer tests with sweetpotato varieties and pasture; and comparisons of grazing systems. Several projects were in cooperation with the U. S. Department of Agriculture.

[Field crops experimentation in North Carolina, 1933–34], C. B. Williams, W. H. Rankin, S. C. Clapp, E. G. Moss, C. W. Bacon, J. J. Skinner, H. B. Mann, G. A. Cummings, R. E. Currin, Jr., P. H. Kime, S. G. Lehman, J. H. Moore, J. A. Shanklin, R. T. Stutts, D. B. Anderson, J. G. Knapp, G. K. Middleton, C. D. Grinnells, R. C. Hastings, M. E. Gardner, and R. Schmidt (*North Carolina Sta. Rpt. 1934, pp. 29–35, 37–43, 44, 45, 46, 47, 48, 51, 68, 69, 71*).—The progress of research with field crops (E. S. R., 74, p. 27) is reported on from the station and substations, which included variety tests with cotton for yield and wilt resistance, corn, wheat, oats, barley, soybeans, red clover strains, potatoes, and tobacco; breeding work with cotton, corn, wheat, oats,

barley for grain and forage, potatoes, and soybeans; inheritance and heterosis studies with cotton; intercropping of corn and soybeans; lespedeza and kudzu as supplementary grazing crops; effects of certain dusts and sprays on growth, yield, and quality of peanuts; tobacco research concerned with fractional applications and placement of fertilizers, fertilizer and lime requirements in rotation, tobacco seedbed fertilizer experiments, phosphorus sources, nitrogen sources, potash sources with constant sulfur and chlorine and needs of tobacco for sulfur and minor elements, and the effects on yield and quality of crop rotation and of preceding soybeans; fertilizer experiments with cotton, involving phosphorus carriers, organic: inorganic nitrogen ratios, concentrated fertilizers and methods of applying them, use of sulfur, and placement studies; seed treatments for cotton and potatoes; cotton fiber studies dealing with effects of source and care of seed, physical properties of lint of improved varieties, the influence of illumination upon the structure of the cotton fiber cell wall, origin and early stages of elongation in the cotton fiber, grade and staple of North Carolina cotton, and local market price in relation to grade and staple length; cultural needs of corn and soybeans in rotation and the form and rate of lime for corn on muck soil; fertilizer mixtures for potatoes and sweetpotatoes; the yields and quality of different field crops when grown in variously fertilized and limed rotations on several soil types; sources of phosphorus for crops grown in rotation; the utilization of crops grown in rotation with cotton by two different methods; and dairying as a supplementary enterprise to cotton farming in the Piedmont area. A number of lines of investigation were in cooperation with the U. S. Department of Agriculture.

[**Agronomic studies in Vermont**] (*Vermont Sta. Bul. 425 (1937), pp. 20–22*).—Progress results are given on increasing the fertility of flood deposits and control of riverbank erosion by growing suitable grasses and clovers, and experiments on the influence of reseeding and fertilization on growth and composition of pasture and hay plants.

Studies on malting quality.—I, 1935 variety trials, J. A. Anderson and H. Rowland (*Sci. Agr., 17 (1937), No. 10, pp. 593–600; Fr. abs., p. 600*).—In malting tests made at the University of Manitoba on samples of 14 varieties of barley, each grown in 1935 at from 4 to 13 experimental stations in Canada, none of the 8 smooth-awned 6-rowed barleys, Brandon 1099, Byng, Newal, Nobarb, Regal, Velvet, Wisconsin 38, and York, produced both as high an extract yield and diastatic power as the standard malting variety O. A. C. 21. Byng, Velvet, and York, at eastern stations only, compared favorably with O. A. C. 21 in extract yield, while Newal was characterized by very high diastatic power. The rough-awned 6-rowed Peatland and Pontiac and the 2-rowed Victory and Washington proved about equal to, and Olli was superior to, O. A. C. 21 in production of extract and diastatic power. Study of mean values over 5 varieties for each of 11 stations showed that protein content of barley and extract yield of malt are inversely correlated ($r=-0.852$), and that protein content and diastatic power are directly correlated ($r=0.916$).

Monoecious buffalo grass, Buchloe dactyloides, K. Anderson and A. E. Aldous (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 709, 710, fig. 1*).—Monoecious plants of buffalo grass, constituting 5.8 percent of the population of a nursery plat, are under study at the Kansas Experiment Station.

The chemical composition of drouth-injured corn plants, W. E. Loomis (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 697–702*).—Severely drought-injured corn, selected by the Iowa Experiment Station in 1934, had the same ratio of leaves to stalks as did normal plants but weighed only 37 percent as much as the stover of normal plants and 19 percent as much as the fodder.

It is shown that failure of the corn plant to form starch in the vegetative organs makes drought-injured or barren stalks poor substitutes for normal bearing plants. Sucrose, the principal storage form of the stalk, is readily lost during curing and storage. High sugar coupled with high soluble nitrogen favors the heating of stover and the formation of poor quality silage. The rapid losses of sugars from plants left standing in the field or air-dried slowly suggest that drought-injured corn would make better feed if it could be cut while still green and dried rapidly, perhaps mowed and dried in the swath, and then ensiled or handled as hay.

Standard descriptions of registered oat varieties, R. A. Derick (*Canada Dept. Agr. Pub. 553 (1937), pp. 31, figs. 18*).—Besides the oats varieties noted earlier (E. S. R., 65, p. 529), this revision includes descriptions and illustrations of Gopher, Cartier, and Legacy, also accepted for registration in Canada.

Oats in Canada, R. A. Derick (*Canada Dept. Agr. Pub. 554 (1937), pp. 21, figs. 4*).—Based in part on results of experiments with oats within the Dominion experimental farms system, this bulletin discusses the distribution, adaptation, and varieties of oats, quality in oats, oats diseases, oats in grain mixtures and for hay and pasture, lodging, wild oats, false wild oats, and hull-less oats. An identification key adapted to 35 oats varieties, many grown quite extensively in Canada, is included.

Fertilizers in the subsoil for potatoes, J. Bushnell (*Amer. Potato Jour., 14 (1937), No. 3, pp. 78–81, fig. 1; abs. in Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 444*).—Loosening or artificially aerating the subsoil did not increase the depth of rooting by potatoes on silt loam at the Ohio Experiment Station, while addition of decomposed organic matter, lime, or phosphates to the subsoil distinctly increased root development. The acidity of the subsoil, it is suggested, may be an important factor restricting root growth.

Hybrid vigor in sorghum, R. E. Karper and J. R. Quinby (*Jour. Heredity, 28 (1937), No. 3, pp. 83–91, pl. 1, figs. 3*).—Additional studies of heterosis in sorghum (E. S. R., 57, p. 432) are reported from the Texas Experiment Station. Sorghum varieties were shown to differ in genetic make-up for many genes other than those visible in effect. Milo and hegari, varieties whose hybrids invariably possessed extreme vigor, apparently have many dominant genes favorable to growth and production whose recessive allelomorphs are present in kafir, feterita, kaoliang, Sumac sorgo, and broomcorn. Hybrid vigor of hybrids between these five varieties, although not so great as that of hybrids involving milo or hegari, is often enough to result in grain production double that of their parents. Earliness of maturity characterizes hybrids of this group.

Large increase in grain production resulting from crossing Blackhull with Red kafir was not accompanied by late maturity nor increase in height; these varieties have the same recessive genes for height but a number of different dominant genes affecting growth. Evidently genes directly influencing plant height are not the only genes producing marked heterosis in F_1 sorghum hybrids. In cases of least hybrid vigor, in hybrid offspring of two inbred lines of Blackhull kafir, increased production resulted largely from a slightly greater tendency for hybrids to tiller, without increase in other vegetative characters.

The different degrees of vigor obtained evidently represent differences in number of dominant genes favorable to growth, and effects of these genes, although small individually, are cumulative. While under favorable conditions production should be greatest from plants possessing the most dominant genes favoring growth, under climatic conditions in the important sorghum-growing regions of the United States a variety or hybrid suitable for farm use must be homozygous for certain recessive genes producing the necessary dwarfness and early maturity.

Possibilities evidently exist for the use of crossed sorghum seed and utilization of hybrid vigor for increasing production provided a practical method for producing crossed seed in quantity can be worked out. Such possibilities include the method of bulk emasculation of sorghum flowers with hot water (E. S. R., 71, p. 625), the use of "antherless" (E. S. R., 76, p. 183) or male sterile sorghum, and propagation by cuttings (E. S. R., 68, p. 187).

Male sterility in sorghum: Its possible utilization in production of hybrid seed, J. C. Stephens (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 690–696, figs. 2*).—In F_2 of hybrids of normal sorghums with a male sterile plant of Texas Blackhull kafir, discovered at the Chillicothe, Tex., Substation in 1935, the progeny segregated into classes of about three normal to one male sterile plant. Studies of hybrid vigor in sorghum, particularly those of Karper and Quinby noted above, show that yields from crossed seed may greatly exceed those of parental varieties. This male sterile character may be useful in developing a method for commercial production of hybrid sorghum seed.

Effect of ammonium sulfate on the response of soybeans to lime and artificial inoculation and the energy requirement of soybean nodule bacteria, W. B. Andrews (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 681–689, figs. 2*).—Ammonium sulfate was not harmful to soybean nodule bacteria when increasing amounts up to 600 lb. per acre were applied at the Mississippi Experiment Station to limed and unlimed Lufkin clay. The yield of soybean hay was about 50 lb. per acre greater where ammonium sulfate supplied the nitrogen than where 1 lb. of nitrogen was fixed by nodule bacteria.

The seed value of frosted wheat, N. G. Lewis and A. G. McCalla (*Sci. Agr., 17 (1937), No. 7, pp. 431–444, figs. 4; Fr. abs., p. 444*).—Laboratory and field germination tests on material studied in other experiments (E. S. R., 74, p. 483), and on farmers' samples of frosted wheat, in general confirmed results of other workers in that immaturity by itself did not seem to be a serious factor in reducing seed value. Frost exposure of over 4° F. reduced the percentage of germinable seeds in direct proportion to severity of freezing. Laboratory germination determined by the standard blotter test was a satisfactory index of field germination of unfrozen and mature frozen wheat, but not of immature frozen wheat. All samples commercially graded 4 Northern or higher were satisfactory for seed. Even wheat with poor laboratory and field germination made satisfactory yields on clean land under good growth conditions. Its possible failure under adverse conditions is suggested.

The effect of freezing temperatures and of defoliation on the subsequent growth of wheat plants, A. W. Platt (*Sci. Agr., 17 (1937), No. 7, pp. 420–430; Fr. abs., p. 430*).—Garnet, Reward, Red Bobs 222, Marquis, and Canus spring wheat were injured at the University of Alberta in the two- and five-leaf stages by frost and defoliation. Lightly frozen plants averaged about 5 days later and severely frozen plants about 9 days later in heading than noninjured plants. The differences in days from emergence to heading were accentuated with plants grown to maturity in the greenhouse. Plants injured in the five-leaf stage headed about 2 days later than those injured in the two-leaf stage. Fertile culms per injured and noninjured plant numbered about the same in the greenhouse, but in the field plants severely frosted and those defoliated showed reductions in fertile culms of about 30 and 20 percent, respectively, compared with noninjured plants. Under normal field conditions, plants defoliated in the two- and five-leaf stages matured later and were lower in height and in yield per acre than normal plants. Varietal differences in ability to recover from the same degree of frost injury, evidently existing, were not associated with frost reaction among varieties tested.

Statistical significance of wheat protein percentage differences in varietal trials, A. G. O. WHITESIDE (*Canad. Jour. Res., 14 (1936), No. 11, Sect. C, pp. 387–393*).—Statistical analyses of results of protein determinations on 28 varieties of spring wheat grown in quadruplicate rod-row plats at Swift Current and Scott, Sask., and at Lacombe, Alta., showed the error due to plat variability to exceed greatly the laboratory error. No real differences were found between calculated percentages for composite samples made up from the 4 plats of each station and percentages obtained by averaging results from individual plats. Certain varieties showed definite tendencies toward high protein content. The major environmental effects of station and of replication gave negative correlations between yield and protein content, but when these major factors and influence of variety were removed, yield and protein content were not correlated.

The sulfur content of wheat, J. E. GREAVES and A. F. BRACKEN (*Cereal Chem., 14 (1937), No. 4, pp. 578–581*).—The 21 varieties of spring and winter wheat grown by the Utah Experiment Station under like conditions on a typical deep dry-farm soil, rich in sulfur, near Nephi, were found to have an average sulfur content of 0.18 percent, ranging from 0.15 in Newturk to 0.22 percent in Hard Federation. Kanred wheat grown under different cultural conditions averaged about the same, with considerably smaller variation between different samples. Indications were that cultural methods tending to improve soil productivity only slightly increased the sulfur content of wheat. The total sulfur and total nitrogen of the wheat were highly correlated. All of the sulfur in these wheats evidently was in the organic form.

HORTICULTURE

[Horticultural investigations conducted by the Missouri Station] (*Missouri Sta. Bul. 387 (1937), pp. 72–74, 75–77, 79, 80*).—There are presented brief reports of progress on the following studies: Photoperiodism in plants, by A. E. Murneek and A. D. Hibbard; embryo growth and development of the apple, by Murneek; comparisons of calcium cyanamide, sulfate of ammonia, and nitrate of soda as fertilizers for apple trees, by Murneek and G. E. Smith; the effect of some summer oil sprays upon the carbon dioxide absorption of apple leaves, by R. A. Schroeder; removal of spray residues, by C. G. Vinson; treatment of one-year-old apple trees with thiourea, by Vinson; effects of nitrogen fertilizers on nitrogen and carbohydrate content and flower and fruit production of the strawberry, by Murneek and J. H. Long; nutritional requirements of the grape, by H. G. Swartwout; cabbage variety trials for disease resistance, by Swartwout and Schroeder; and pollination and fruit setting in the tomato, and effect of fertilization upon tomato flowers, both by Schroeder.

The John Innes Horticultural Institution, 1910–1935 (*Cambridge, Eng.: Univ. Press, [1935], pp. 58*).—In this report there are included brief summations of various research activities and accomplishments during the first 25 yr. of the institution's existence.

Plant hormones and their possible importance in horticulture, M. THOMAS (*Sci. Hort. [Wye, Kent, Eng.], 5 (1937), pp. 141–152, pls. 4*).—This is a general critical review setting forth the present status of the subject.

The use of growth substances for inducing root-formation in cuttings, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 27, 28*).—A brief account is given of experiments at the Boyce Thompson Institute in which approximately 100 varieties of cuttings were treated with water solutions of indoleacetic, indolebutyric, or α-naphthaleneacetic acids prior to planting in a half-sand-and-half-peat-moss medium. Among plants success-

fully rooted were species of *Acer, Azalea, Vaccinium, Clematis, Cornus, Corylus, Daphne, Ilex, Magnolia, Malus, Prunus, Rosa,* and *Ulmus.*

Value of the dye-adsorption test for predetermining the degree of hardiness, S. Dunn (*Plant Physiol., 12 (1937), No. 3, pp. 869–874; also New Hampshire Sta. Sci. Contrib. 51 (1937), pp. 869–874*).—Continuing investigations (E. S. R., 69, p. 365), the author reports that the dye-adsorption test on individual plants and even on individual leaves of *Bryophyllum* and cabbage gave contradictory results as checked by subsequent freezing trials. The conclusion was reached that with the two species the dye-adsorption test is not effective in predicting hardiness. Since the hardier groups as a whole showed the higher adsorption capacities, a limited effectiveness of the test was indicated.

Spray materials in relation to spray injury, H. W. Thurston, Jr. (*Md. State Hort. Soc. Proc., 39 (1937), pp. 25–33*).—The Pennsylvania State College suggests that each of the principal ingredients of the common sulfur- and copper-containing spray mixtures is apt to induce serious injury and urges a careful adjustment of schedules to varieties and to the main disease and insect problems in any orchard to take into account both control and injury.

Hotbeds for Kansas, W. B. Balch and F. C. Fenton (*Kansas Sta. Circ. 183 (1937), pp. 29, figs. 19*).—Information is presented on the construction and operation of hotbeds, with particular attention to electrically heated beds and their comparative costs with older types. In addition, information is given on the preparation of the soil and the general cultural care of plants in the beds.

[Vegetable crop studies by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 266–281*).—Among studies the progress of which is briefly discussed are: Fertilizer tests with cabbage, onion sets, sweet corn, and pickle cucumbers, fall and winter cover crops for truck land, effect of time and duration of cutting of asparagus on yield, fertilizer for asparagus, and testing of varieties of tomatoes and cabbage, all by J. W. Lloyd and J. P. McCollum; production of hybrid sweet corn, rate of planting sweet corn, fertilizers for sweet corn, and breeding of tomatoes, all by W. A. Huelsen; fertilizers for greenhouse tomatoes, by Lloyd; breeding of lima beans resistant to drought, by Huelsen; and the culture of the horseradish, by Lloyd, McCollum, and K. J. Kadow.

[Vegetable studies by the North Carolina Station], M. E. Gardner and R. Schmidt (*North Carolina Sta. Rpt. 1934, pp. 70, 71*).—Among investigations the progress of which is discussed are fertilizer studies with vegetables in Avery County, the testing of vegetable varieties, the fall seeding of onions, and the fertilizer requirements of early cabbage.

Interrelation between fertilizer analyses and placement on the yield and growth of certain vegetable crops, M. M. Parker (*Natl. Joint Com. Fert. Appl. Proc., 12 (1936), pp. 13–18*).—Working with snap beans, lima beans, and cabbage, the Virginia Truck Experiment Station observed that each crop responded differently to the method of application and the type of fertilizer used. In both types of beans, placement of fertilizer directly under the row reduced germination. With the snap bean, potash in the fertilizer depresesd germination in direct ratio to the content, but with the lima bean potash did not have any significant influence. With cabbage the mixing into the soil in the row of part of the fertilizer prior to setting the plants, with the remainder used as a side dressing, proved a successful procedure.

Studies of quality in canning corn, C. W. Doxtator (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 735–753, fig. 1*).—Studies at the University of Minnesota on the use of a puncture machine showed, as an average of 2 years' tests, significant differences in tenderness at the canning stage in 66 single

crosses of Golden Bantam sweet corn. Chewing tests for tenderness of 11 cultures grown in 5 test seasons gave differences approaching significance, whereas puncture tests on the same materials gave significant differences. Inbred lines showing low puncture indexes tended to yield crosses of low puncture index. Tenderness in F_1 crosses was intermediate in comparison with the parents. Both the puncture and the chewing tests revealed seasonal differences in tenderness. Stage of maturity as measured by the percentage of moisture at harvest was negatively and very significantly correlated with puncture index. In studies with four cultures of Golden Bantam, differences were observed in pericarp thickness between the precanning and postcanning stages of development. An increase in number of ears per sample was found more important in accuracy-of-tenderness readings than was the number of tests per ear.

The Mincu—a new pickling cucumber, A. E. Hutchins (*Minn. Hort., 65 (1937), No. 8, pp. 152, 153, 160, figs. 2*).—A description is offered of a new variety of cucumber produced by the Minnesota Experiment Station, with data presented on the comparative yield of the new variety with older-established kinds.

A mechanical apparatus for the rapid, high-temperature microbial decomposition of fibrous, cellulosic materials in the preparation of composts for mushroom cultures, B. B. Stoller, F. B. Smith, and P. E. Brown (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 717–723, fig. 1*).—In this contribution from the Iowa Experiment Station, the authors describe an apparatus by which moisture and air are distributed uniformly in the compost and no firefang occurs. From 20 to 30 percent loss of dry weight or organic matter was obtained in from 7 to 10 days, with a very rapid evolution of carbon dioxide. When air entering at the rate of 5 cu. ft. per minute was shut off, the carbon dioxide concentration rose from 1.2 to 19 percent in 15 min.

[Pomological investigations by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 243–247, 248–250, 251–256, 257–261, 263–266, fig. 1*).—Included are progress notes on the following investigations: Apple and peach breeding, by J. C. Blair, M. J. Dorsey, and J. S. Whitmire; pruning of the apple, by W. A. Ruth and V. W. Kelley; fertilization of the apple, by Dorsey and R. S. Marsh; deep cultivation of the apple, by Ruth; thinning of apple and peach fruits, by Dorsey and R. L. McMunn; removal of spray residues, by Ruth and D. S. Brown; cover crops for apple orchards, by Dorsey, McMunn, and Marsh; breeding of pears for fire blight and leaf spot resistance, by H. W. Anderson; cover crops for peach orchards, by Dorsey and Ruth; fertilization of peach orchards, by Dorsey and McMunn; low temperature injury to peach and apple trees, by Dorsey and Anderson; low temperature resistance of various peach, plum, and cherry varieties, by McMunn; rootstocks for cherries, by Dorsey and McMunn; comparative resistance of grape varieties to low winter temperatures, by A. S. Colby; strawberry, gooseberry, and raspberry breeding, by Colby; and the relation of disease and insect control to winter injury in the raspberry, by Anderson and K. J. Kadow.

[Pomological investigations by the North Carolina Station], C. F. Williams, I. D. Jones, and R. Schmidt (*North Carolina Sta. Rpt. 1934, pp. 59–61*).—There is reviewed briefly the progress of studies in peach nutrition, factors influencing the premature defoliation of the peach, relation of leaf area and growth in the peach, culture of pecan orchards, breeding of pecans, pruning and fertilization of the dewberry, and breeding of the raspberry.

Pomologists should not overlook the varietal problems in fruits, M. A. Blake (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 1–4*).—Stating that the

varietal problem has advanced beyond the simple testing of varieties, the author discusses some of the present trends and needs in varietal research, such, for example, as the breeding of fruits to meet special needs, e. g., the preservation by freezing, adaptation of varieties to high and low seasonal temperatures and to acid or neutral soils, the development of varieties with annual fruiting habits, etc. Such studies require the help of the trained plant breeder, the biochemist, the physiologist, and the varietal specialist.

Root development of trees as affected by physical properties of the soils, C. E. SCHUSTER (*Wash. State Hort. Assoc. Proc., 32 (1936), pp. 22–26*).—Preliminary studies by the U. S. D. A. Bureau of Plant Industry and the Oregon Experiment Station, primarily on walnut and filbert, indicated that lack of soil aeration may result from the filling of the natural pore space of the deep soils with minute clay or colloidal materials of high moisture capacity. Good orchard soils have an effective depth of 8–10 ft. Soils with effective depths of 5–6 ft. proved profitable in favorable growing seasons, but shallower soils always gave marginal returns. Soils of 3 ft. depth are more or less satisfactory for young trees, but the inability of the roots to penetrate to lower levels soon slows down growth. Corrective measures are suggested.

Experiments on the hardiness of peach and apple fruit buds (a preliminary report), H. E. KNOWLTON (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 238–241*).—Utilizing a freezing unit with temperature control, the West Virginia Experiment Station found that the basal buds of the peach are more hardy in late fall and early winter than are apical and median buds. Belle of Georgia and Greensboro buds withstood experimental temperatures of −10° and −14° F., respectively. Rate of temperature rise did not apparently influence injury. Yellow Transparent, McIntosh, and Rome apple buds were found more resistant to cold in February than were Grimes, Delicious, Golden Delicious, and Stayman. In some cases, apple buds withstood a minimum of −32.5° F., but there occurred severe injury to the conducting and pith tissues.

Apple breeding studies.—II, Fruit shape, A. N. WILCOX and E. ANGELO (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 9–12*).—In this second paper (E. S. R., 76, p. 335), the Minnesota Experiment Station discusses a procedure for the determination of fruit shape in apple seedlings and also the application of the technic of the study to the inheritance of shape in different parental crosses. It was evident that certain parents have tendencies to transmit specific shapes to their progeny. In general, greater variation was found in respect to the inheritance of shape than of color.

A hetro-chimeric apple sport and its vegetative progeny, V. R. GARDNER (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 4*).—There was reported by the Michigan Experiment Station the discovery in a Michigan orchard of a whole tree sport apparently of Northern Spy. This tree produces fruits of great diversity in size, color, shape, and maturing season, though all of them resemble Northern Spy in flesh character. By grafting there have been segregated from the parent a considerable number of distinct strains or types.

Fruitfulness in the apple [trans. title], C. F. RUDLOFF and H. SCHANDERL (*Gartenbauwissenschaft, 11 (1937), No. 3, pp. 251–271, fig. 1*).—Of a total of 219 apple varieties, 36 percent were found to be inferior and 64 percent good pollen producers. Of 143 varieties tested over a period of years for self-fruitfulness, 141 were practically fully unfruitful. Four new groups of intersterile varieties were discovered, viz, Kanada-Renette×Weisser Winter-Calkvill, Kanada-Renette×Goldparmäne, Blenheimer Goldrenette×Goldparmäne, and Schöner aus Boskoop×Transparent aus Croncels. The authors point out that

no one apple variety may be correctly designated as a universal pollenizer for all others.

Nutrition of apple trees, M. A. Blake, G. T. Nightingale, and O. W. Davidson (*New Jersey Stas. Bul. 626 (1937), pp. 41, pls. 7, figs. 9*).—One-year-old grafts of the Blaxtayman apple were grown in the greenhouse in 3-gal. porcelain jars containing nutrient-free white sand supplied with nutrient solutions lacking, respectively, in calcium, nitrogen, phosphorus, magnesium, and potassium, with complete solutions as controls. With the aid of colored plates, the effects of the different nutrient deficiencies are carefully described. A lack of calcium resulted in marked stunting, followed by death of stem and root tips, and although insoluble calcium was present in the old roots and stem base, it was not reutilized in sufficient amounts. Leaf discoloration and spotting did not appear until early in the second season. Magnesium deficiency became apparent rapidly, and although freely reutilized, magnesium was not adequate because of the great demand for this element. Characteristic leaf injury soon developed, followed by abscission. New growth was very low in carbohydrates, small in diameter, and deficient in woodiness. Root growth was also sharply curtailed. Lack of nitrogen was indicated in the early appearance of yellowish-green leaf blades and a reddening of the veins of the lower leaves. There was no conspicuous marking or spotting. Carbohydrates accumulated in high concentration. Cambial activity was limited, and root growth, though extensive, was woody and abnormally slender. The early response of trees to phosphorus deficiency was comparable to that of trees lacking nitrogen. After 4 mo., phosphorus-deficient trees became very low in starch and proteins and high in sugars. The new stem growth was very slender and the new leaves small, thin, dark green, and tinged with dark red. In the case of potassium-deficient trees, the element was so freely reutilized that for several weeks there were no manifestations. In time, diameter growth of the new wood was notably curtailed and the leaves showed a marginal scorch. New leaves, though smaller and thinner, exhibited normal dark green color.

The application of the findings to orchard conditions is discussed, with the suggestion that such deficiencies are more likely to occur on light sandy and light gravelly soils. The importance of using fertilizer and cultural practices that maintain the fertility of the entire orchard area is stressed.

Potash and phosphorus in relation to organic matter in New York orchards, R. C. Collison (*New York State Sta. Bul. 679 (1937), pp. 18*).—Elaborating on the general situation with regard to the experimental use of fertilizer in apple orchards, the author reports that investigations conducted by the station during the past 10 or 12 yr. with plats arranged according to the best-known statistical procedure have shown no significant response to either phosphorus or potash. On the other hand, under sod or partial sod conditions orchard trees showed a significant response to nitrogen. Among reasons set forth for the lack of response of fruit trees to phosphorus and potash are the deep foraging capacity of tree roots, the possible abundance of these elements in the lower depths, and the relatively brief history of New York orcharding. The author suggests that since crops remove large amounts of potash and considerable amounts are lost in drainage water, it is likely that potassium will, next to nitrogen, assume importance in the fertilizer program. Some of the symptoms of potash deficiency are discussed, with the comment that growers located on light-textured soils should be on the watch for such deficiencies. Data presented from lysimeter experiments showed that phosphorus equivalent to over 100 lb. of superphosphate and potash equivalent to 200 lb.

of muriate of potash may be made available each year through the growth and decomposition of cover crops. Some important distinctions between static and dynamic organic matter in the soil are drawn and their relation to crop production is discussed.

Some further observations on the depletion of subsoil moisture by apple trees, C. C. WIGGANS (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 160–163*).—In this second paper (E. S. R., 76, p. 792), the author presents further evidence that apple trees growing in an area of limited rainfall may utilize subsoil water from great depths. At the University Fruit Farm, Union, Nebr., a total of from 31 to 35 in. of water was used by the trees, competing plants, and direct evaporation. This was much above the average rainfall. The greatest draft on subsoil moisture was directly under the tree. The heavy loss of moisture occurred in the 16–25 ft. zone, presumably because the upper levels were already approaching exhaustion of water available to the species.

Changes in hydrogen-ion concentration in the growing apple fruit, O. EINSET (*Gartenbauwissenschaft, 11 (1937), No. 3, pp. 319–323, fig. 1*).—In this study, carried on by the New York State Experiment Station, an attempt was made to discover any possible relationship between the H-ion concentration in the apple fruit and premature dropping. In general, H-ion concentration decreased steadily during the period extending from the unopened bud until full bloom. A sharp increase followed for about five weeks until the end of June, and thereafter a fairly constant level was maintained. On any one tree the larger fruits had the higher H-ion concentration during the early stages, but after all fruits were full-grown the differences disappeared. Depending on varieties and abundance of flowers, the shedding of fruit continued more or less uniformly until the maximum H-ion concentration was reached about July 1. There was some suggestion that H-ion concentration is correlated with plant vigor, the least vigorous trees bearing fruits of the highest pH.

How much should the apple crop be thinned? M. A. BLAKE (*N. J. State Hort. Soc. News, 18 (1937), No. 4, pp. 915–917, 932, fig. 1*).—In studies conducted by the New Jersey Experiment Stations, young Stayman Winesap trees did not respond as definitely to thinning treatments as did Rome, with indications that young trees just coming into fruiting may not require the same degree of thinning as do older trees. Thinning young Stayman Winesap trees to 20 leaves per apple (from 12 to 15 in. apart), as compared to 10–12 leaves (from 6 to 8 in. apart) reduced the number of apples and the total yield by 50 percent. In the Rome, the reduction in number of fruits was compensated in a greater degree by increased size so that severe thinning did not lower total yields to anywhere near the extent occurring in Stayman Winesap. Grimes Golden responded similarly to Rome in that increment in size of fruit compensated, in a considerable degree, for loss in total number.

Blossom thinning of Wealthy so that the remaining spurs were from 10 to 12 in. apart resulted in good crops the same year and in the following year. Blossom thinning is conceded much more potent in influencing the next crop than is fruit thinning. For varieties with a biennial tendency, spacings of from 9 to 12 in. (12–15 leaves per fruit) are conceded desirable where fruit is designed to meet modern market demands.

December pruning in 1935 results in severe injury to Jonathan and Stayman trees at La Fayette, Indiana, C. L. BURKHOLDER (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 49–51, figs. 2*).—Heavy pruning in December 1935 of 10-year-old Stayman and Jonathan trees in the Purdue University orchards resulted in serious injury and death in several instances. At the same time, pruning of 14-year-old trees resulted in severe injury to Stayman, moderate

injury to Winesap, slight injury to Golden Delicious, and no detectable harm to Rome, Delicious, and Grimes. January and February 1936 were abnormally cold. The advisability of deferring the pruning of susceptible varieties until late February is pointed out.

Spray injury investigations, H. S. McConnell and E. J. Anderson (*Md. State Hort. Soc. Proc., 39 (1937), pp. 42–47*).—This is a summary of preliminary work by the Maryland Experiment Station on spray injury to apple trees of different varieties by various fungicides and insecticides.

Weather as a factor in causing spray injury, F. J. Schneiderhan (*Md. State Hort. Soc. Proc., 39 (1937), pp. 33–41*).—This contribution by the West Virginia Experiment Station discusses some of the factors involved in spray injury to apple trees, presents selected orchard experimental data, and describes the types of spray injury (sulfur, copper, arsenical, and fruit russeting). It is concluded that the main factor conditioning spray injury is the weather.

The keeping qualities of apples in relation to their maturity when gathered, F. Kidd and C. West (*Sci. Hort. [Wye, Kent, Eng.], 5 (1937), pp. 78–86, figs. 8*).—Repeated harvests of Bramley Seedling apples showed a considerable gain in average weight as picking was delayed, but there was an increased hazard of wind losses. The less mature fruits lost more water in storage. Without control measures the earlier the apples were gathered the more susceptible were the fruits to surface scald. Break-down occurred sooner in fruits picked at the peak of the climacteric than before or after. The production by ripe fruit of volatile substances that stimulate respiration in less mature fruits is discussed, and leads to the suggestion that fruits of different stages should not be stored in the same compartments.

Material for the breeding of winter hardy pears, A. N. Wilcox (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 13–15*).—Stating that there are more than 50 varieties and species of pears growing at the University of Minnesota fruit breeding farm, some of which have been under trial for more than 10 yr., the author presents in tabular form data on the resistance of the varieties to the severe winters of 1934–35 and 1935–36. Crosses of *Pyrus communis* with Asiatic forms of the pear usually yielded seedlings of low survival due to low average hardiness, but there were certain exceptions. The best survival and the highest average hardiness were secured in the F_2 generation obtained by subjecting F_1 hybrids to open pollination.

Pear pruning in relation to the number, size, and appearance of fruits, W. W. Aldrich (*Oreg. State Hort. Soc. Ann. Rpt., 28 (1936), pp. 109–116*).—Studies conducted by the U. S. Department of Agriculture near Medford, Oreg., showed that with bearing pear trees a reduction in the number of blossoms per tree by hand removal, by spur pruning, or by heavy dormant pruning usually resulted in fewer fruits per tree. Anjou was an exception in usually producing an increase in the number of fruits per tree following the year of heavy pruning. When heavy pruning increased the total length of new shoot growth, the resulting increase in shoot-leaf area seemed to be one of the reasons why heavier pruning resulted in larger fruit. This was explained by the fact that shoot leaves were more effective in stimulating fruit growth than were spur leaves. The incidence of black end in Bartlett was apparently not influenced by either summer or dormant pruning. Cork development in Anjou was reduced slightly by summer pruning and increased by heavy dormant pruning.

The irrigation of pears on a clay adobe soil, A. H. Hendrickson and F. J. Veihmeyer (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 224–226, figs. 2*).—Observations by the California Experiment Station on the growth of fruit on Bartlett pear trees approximately 30 yr. of age, part irrigated twice and part

with no added water, showed comparable development of fruit approximately to the end of June. Decreased growth noted thereafter on the dry-plat fruit began about the time the moisture content in the upper 4 ft. reached the permanent wilting percentage. Fruits stored at 36° and 50° F. for 2 weeks and then ripened at 70° showed no differences in keeping quality attributable to moisture conditions in the soil.

Fruitfulness in the pear [trans. title], H. Schanderl (*Gartenbauwissenschaft, 11 (1937), No. 3, pp. 297–318, figs. 2*).—Of 198 pear varieties examined in the period 1933–36, 41 were found to be poor pollen producers. Intersterility was observed in the Gute Luise × Williams Christbirne (Bartlett) combination, especially when Gute Luise was the ovule parent. No variety was capable of being classed as a universal pollenizer. Esperens Bergamotte and Neue Poiteau alone produced marketable fruits without cross-pollination. Jeanne d'Arc had imperfect flowers, preventing wind pollination and necessitating insect visitation. Napoleon Butterbirne produced only seedless fruits, even with cross-pollination.

Fruit bud hardiness in peach varieties, R. L. McMunn (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 233–237*).—Observations by the Illinois Experiment Station on fruit buds of 43 varieties of peaches planted in 1926 and producing their first crop in 1931 showed over a period of 4 yr. some peculiar responses to low winter temperatures. In 1931–32 some killing occurred with a minimum of 7° F. In 1932–33 a minimum of −9° killed fewer buds than the preceding year. In 1933–34 the temperature of −2° caused no killing on two occasions, but on the third drop to −2° a greater kill resulted than with −9° the preceding year. Various factors, such as bud development, time of year when the low temperature occurred, the rapidity of the drop, etc., are believed to be involved. Varieties did not take the same relative rank year after year, which showed the need of several years' records. Among consistently resistant sorts were Carman, Greensboro, Marigold, June Elberta, Massasoit, Rochester, and Rosebud.

The external characters of green fruits of the peach are valuable aids in varietal identification, H. J. Sefick and M. A. Blake (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 5–8, fig. 1*).—At the New Jersey Experiment Stations there was noted a close resemblance in general form between small green peach fruits at the pit-hardening stage and mature fruit. Nine terms, namely, round, oval, ovate, obovate, oblique, oblate, round truncate, winged, and peento, were found adequate, with certain modifications, for the classification of shape of peaches. The particular characters found useful in certain varieties are discussed in some detail.

The comparative canning quality of some varieties of peaches grown in the East, I, II, C. W. Culpepper, H. H. Moon, and J. S. Caldwell (*Canner, 85 (1937), Nos. 6, pp. 11, 12, 17, 18, 20, fig. 1; 7, pp. 14, 16, 17*).—A total of 45 varieties of peaches, grown largely at the U. S. D. A. Arlington Experiment Farm, Va., were tested for their canning value. The variety Stump ranked highest of all in flavor but was poor in texture and of white color. Of firm-fleshed peaches, Motion Cling and Tuskena rated high in flavor. In the Elberta group, Early Elberta, October Elberta, and Ideal, and in the Crawford group, Slappey and Reeves rated high in flavor. Golden Queen, a firm-fleshed clingstone, ranked highest in color, with Motion Cling, Ambergem, Goodman Choice, and Up-to-Date very good. When tree and fruit characters were both considered, Motion Cling, Tuskena, and Goodman Choice appeared the most promising canning varieties. Of melting-fleshed types, Ideal, Up-to-Date, Early Elberta, J. H. Hale, and Wilma appeared most promising.

Injury to the buds of grape varieties caused by low temperatures, J. H. Clark (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 408–413*).—Following the winters of 1933–34 and 1934–35, when minima of −16° and −14° F., respectively, were reached, microscopic examinations were made at the New Jersey Experiment Stations in early March of the buds of many varieties. Injured buds had both the vegetative growing point and the flower primordia killed. Data on the varieties are presented in tabular form, permitting a classification into groups. Contemporary observations on some pure vinifera grapes showed complete bud loss in practically every variety. In most of the grapes examined the wood of the canes appeared less susceptible to injury than did the buds, and certain of the varieties produced a good commercial crop when as many as 39 percent of the primary buds were killed.

The composition of grape juice as affected by the method of vine training, J. E. Webster and F. B. Cross (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 405–407*).—Further studies (E. S. R., 76, p. 481) of the juices pressed from grapes of several different varieties and gathered from different parts of the trellis showed no significant difference in chemical composition as related to position on the trellis. The analytical data are presented in detail.

Carbohydrate accumulation in relation to vegetative propagation of the litchi, W. W. Jones and J. H. Beaumont (*Science, 86 (1937), No. 2231, p. 313*).—Stating that under ordinary conditions starch rarely accumulates in litchi nonflowering shoots to a greater extent than from 0.4 to 0.5 percent of the dry weight, the Hawaii Experiment Station found that by removing a small ring of bark about one-eighth of an inch in width from the base of the shoot about 3 or 4 weeks before the scion was cut, the starch content and the percentage of successful grafts could be greatly increased. The method was also employed successfully in the propagation of the macadamia nut.

[Floricultural studies by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 281–284*).—Included are brief reports on studies of the soil requirements of carnations, particularly with reference to the need for the annual change of the soil, by F. F. Weinard; testing of peony varieties, by Weinard and H. B. Dorner; and comparative productivity of different greenhouse roses and spacing of carnations in the greenhouse, both by Weinard.

[Floricultural studies by the North Carolina Station] (*North Carolina Sta. Rpt. 1934, pp. 71–73*).—In addition to testing varieties of herbaceous perennials, tulips, roses, and chrysanthemums out of doors, greenhouse tests were made of roses and carnations, of the development of new carnations by crossing, and the effects of pruning on the snapdragon.

Prolonging the flowering period of chrysanthemums with the use of supplementary illumination, G. H. Poesch (*C. R. E. A. News Letter [Chicago], No. 15 (1937), pp. 34, 35*).—In a contribution from the Ohio Experiment Station results are briefly reported of studies which showed that supplementary additional light applied before August 15 and discontinued October 1 was most effective in retarding flower bud differentiation of the chrysanthemum. Mazda lamps installed to emit at least 3-ft. candles at the furthermost point from the lamp were more satisfactory than daylight, medium and light blue, and mercury lamps. Increasing the day length to 15 hr. is sufficient to retard flowering. Production of pompons is greatly reduced by retarding the bud formation. The number of flowers per spray was greatly reduced. Varieties differ greatly in response to this treatment. Standard and disbud varieties can be retarded with greater financial success than pompons. Some of the better varieties were found to be Monument, Marie DePetris, Crimson Glow, December Glory, Orchid

Beauty, Cordova, and Rolinda. The strong-growing varieties were found most adaptable for use in retarding studies. Plants to be retarded should be propagated in June and planted in July. The last pinch should be made shortly before applying additional light.

Forcing flower buds in gardenia with low temperature and light, J. M. Arthur and E. K. Harvill (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 405–412, figs. 3*).—Studies at the Boyce Thompson Institute of the factors influencing the flowering of the gardenia during the winter months indicated that large, well-developed flower buds could be induced to open during the winter by supplemental light from 500-w lamps used intermittently for a period of from 4 to 6 hr. per night. Plants held at temperatures above 70° F. during the early stages of bud development failed to produce flower buds. Low temperatures during the night were adequate for bud development, even though the day temperatures rose rather sharply due to insulation. An insulated house was particularly desirable for gardenias, due to effective control of relative humidity and temperature and the development of a high carbon dioxide content in the air.

Spring-treatment of autumn-harvested gladiolus cormels, F. E. Denny (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 351–353*).—Cormels of seven varieties reputed to germinate with difficulty in the year succeeding the harvest year, were, after storage at room temperature and at 10° C., treated at the Boyce Thompson Institute with ethylene chlorohydrin prior to planting. Distinct gains in germination of cormels or yield of corms, or both, were secured in all the varieties. Three of the kinds responded to the gas, irrespective of the previous storage temperature. Two responded only after cool storage, and two others—W. H. Phipps and Golden Measure—received so much stimulus from low temperature alone that the benefit from the gas treatment was only moderate.

A retrial of the ethylene chlorhydrin method for hastening the germination of freshly harvested gladiolus corms, F. E. Denny (*Contrib. Boyce Thompson Inst., 8 (1937), No. 6, pp. 473–478*).—With corms harvested in late September and early October the chemical treatment hastened germination in all 9 varieties tested, but the most favorable results with 4 of the varieties were obtained only when the treatments were applied after a preliminary cold-storage period. With the varieties responding without cold storage, the gain from chemical treatment in time required for germination was 3–5 mo., or even more. With those needing preliminary cold storage before chemical treatment, the gain varied with varieties from about 10 days to more than 4 mo. Untreated corms of the Mrs. F. C. Peters variety remaining in the soil for 117 days without germinating were removed and treated with ethylene chlorohydrin, with the result that they germinated promptly while the controls remained dormant for at least another 100 days.

The problem of the blue hydrangea, E. M. Chenery (*Jour. Roy. Hort. Soc., 62 (1937), No. 7, pp. 304–320*).—Based on chemical examinations of the soil and of the plant tissues, the author concludes that the change in color of pink or red hydrangea flowers to blue is the result of absorption of aluminum, probably as ions from the soil solution, followed by the formation within the flower tissue of a blue-colored aluminum-delphinidin complex.

House plants and their care, W. B. Balch (*Kansas Sta. Circ. 184 (1937), pp. 16, figs. 6*).—This is a revision of a previously noted publication (E. S. R., 50, p. 141) and in the same manner presents general cultural information.

FORESTRY

Fernow hickory (Hicoria fernowiana Sudw.), W. A. Dayton (*Jour. Forestry, 35 (1937), No. 9, pp. 859–864, figs. 2*).—Stating that no group of American trees is in greater taxonomic confusion than the hickories, the author reports the rediscovery in Washington, D. C., of the type tree of *H. fernowiana*, a long-forgotten species described by G. B. Sudworth many years ago. It is suggested that *H. fernowiana* is a valid species allied to the pecan.

A tree classification for lodgepole pine in Colorado and Wyoming, R. F. Taylor (*Jour. Forestry, 35 (1937), No. 9, pp. 868–875, figs. 6*).—Four classes distinguished according to vigor were found to differ significantly in rate of growth in both uncut and cut-over stands. Diameter growth plotted over age had almost the same trend before as after cutting with average release. The 200-year-old trees increased their diameter growth following release almost as much as did 100-year-old trees.

The problem of selecting the desirable pine species for forest planting in Ohio, J. B. Polivka and O. A. Alderman (*Jour. Forestry, 35 (1937), No. 9, pp. 832–835*).—A study of 10 species of pine commonly planted in Ohio, as to susceptibility and resistance to various plant diseases, insects, and the yellow-bellied sapsucker, indicated that white, jack, and Norway pines are the most desirable species.

Association types in the north coast ranges of California, H. W. Clark (*Ecology, 18 (1937), No. 2, pp. 214–230, figs. 5*).—Stating that the north coast ranges of California may be divided into two portions, one an outer, humid coast region, and the other a warmer and drier interior, the author segregates the vegetation into six major groups designated as follows: Prairie, meadow, chaparral, woodland, sierran montane, and humid coast forest association types. Four biotic areas are recognized in the distribution of characteristic tree species according to temperature and moisture conditions.

The forest soil of the Douglas fir region, and changes wrought upon it by logging and slash burning, L. A. Isaac and H. G. Hopkins (*Ecology, 18 (1937), No. 2, pp. 264–279*).—Analysis of a typical Douglas fir soil near Carson, Wash., showed the duff, approximately 32 tons per acre, to contain approximately 28 tons of organic matter, 594 lb. of nitrogen, 76 lb. of phosphorus, 555 lb. of calcium, and 121 lb. of potash. The duff was also concerned with soil moisture-holding capacity and soil reaction. Heavy slash fires caused an almost complete destruction of the duff layer, which averaged about 1.5 in. deep. Slash fires caused some dehydration of secondary minerals, colloidal break-down, and changes in the structure of the surface zone of the mineral soils. Blackening of the surface soil increased heat absorption, sometimes to a dangerous point for tree seedlings. The increased productivity following fires may temporarily stimulate growth of Douglas fir to a point where the trees are less able to resist drought. The authors conclude that the harmful effects of the ordinary slash fire more than outweigh possible benefits.

The interception of precipitation in an oak-pine forest, O. M. Wood (*Ecology, 18 (1937), No. 2, pp. 251–254*).—In a mixed forest of oak, pine, and gum typical of the northern edge of the New Jersey barrens, there were set up by the Allegheny Forest Experiment Station four rain gages. Based on readings after 145 storms, the average catch of rainfall in the woods was 87.2 percent of that in the open. The proportion of rain reaching the soil in the woods increased with the intensity and duration of the storm. Less moisture penetrated the crowns in the form of snow than as rain. The proportion of precipitation

which penetrated the crown of a chestnut oak did not increase after the leaves had fallen.

The influence of soil profile horizons on root distribution of white pine (Pinus strobus L.), H. J. LUTZ, J. B. ELY, JR., and S. LITTLE, JR. (*Yale Univ. School Forestry Bul. 44 (1937), pp. [120], figs. 20*).—A total of 17 profiles were examined in relatively even-aged pure stands of white pine, 35–45 yr. old, located in the Yale Forest near Keene, N. H. In most of the profiles the largest number of roots occurred in the A and B horizons or in their subdivisions. A indicated the upper eluvial layer of mineral soil, from which material had been removed by chemical and physical processes, and B, the illuvial layer underlying A—the zone of enrichment or accumulation. However, the highest average number of roots per square foot was found in horizon H, the layer of amorphous matter just above A. Figures for the various horizons indicated that root distribution varies according to the horizons, with the greatest development in the upper layers.

Mechanical composition of the horizons influenced root distribution, development being unusually poor or lacking in soil containing 90 percent or more of sand. The most favorable conditions for root growth were provided by loamy sand, sandy loam, and loam. No clays were contacted in the study. As to moisture, root development was poor or lacking in horizons with moisture equivalents of 4 percent or less. Nitrogen content and relatively high base exchange capacity appeared to favor root development. No consistent relation was established with H-ion concentration. Summing up, the authors assert that the A and B horizons with the organic layers merit the most careful consideration by forest ecologists because they support the greater number of roots.

Soil temperature effects on forest tree seed germination and seedling development (*Vermont Sta. Bul. 425 (1937), p. 27*).—A brief note on progress.

Eastern red cedar, M. E. JELLEY (*Jour. Forestry 35 (1937), No. 9, pp. 865–867*).—Of several methods of treating seeds—(1) freezing in a block of ice for 21 days, (2) in moist peat moss at 41° F. for 66 days, (3) treatment with dilute hydrochloric acid and pepsin prior to stratification, and (4) scarification—the first was the most effective, giving 56.2 percent germination after 45 days. The silvicultural importance of the red cedar in central Tennessee is pointed out.

Kiln temperatures for northern white pine cones, R. C. RIETZ and O. W. TORGESON (*Jour. Forestry, 35 (1937), No. 9, pp. 836–839, fig. 1*).—At the U. S. D. A. Forest Products Laboratory, kiln temperatures up to 140° F. for a duration of 12 hr. did not reduce the vigor of germination of white pine seed. At 160° viability was definitely reduced. The records were obtained in kilns operated with forced circulation and with controlled moisture.

Delayed germination in American elm, P. O. RUDOLF (*Jour. Forestry, 35 (1937), No. 9, pp. 876, 877*).—In a bed of American elm sown in late June with current-crop seed there occurred satisfactory germination in the same season, with a second series of germination the following May. At the same time, beds of *Ulmus glabra*, *U. effusa*, and *U. pumila* did not display this delayed germination. However, a bed of jack pine did exhibit the phenomenon.

Pruning second growth hardwoods in Connecticut, A. E. MOSS (*Jour. Forestry, 35 (1937), No. 9, pp. 823–828, fig. 1*).—In experiments begun by the Connecticut State College in 1932, it was observed that the ladder and hand saw method of pruning gave good results on the "easy side" of the tree but that the labor in changing the position of the ladder increased greatly the time needed for pruning. Observations on the healing of wounds and the time required to make cuts indicated that 2-in. diameter is about the maximum for profitable removal. Pole saws required more skill, especially in the higher cuts. On the

whole. pruning appeared worth while where the tree distribution was so scattered as not to provide natural pruning.

Fire Control Notes, September 20, 1937 (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, [No. 6] (1937), pp. 305–351, figs. 5*).—In the usual manner (E. S. R., 77, p. 791) this pamphlet contains information with regard to forest fires, control equipment, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, October 1 and 15, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 18, pp. 325–339, figs. 4; 19, pp. 341–349, figs. 5*).—Among items of current interest the following are noted:

No. 18.—Interhost transfer attempts with various strains of the bulb and stem nematode (*Ditylenchus dipsaci*) in Utah, by G. Thorne; notes on plant diseases in Wyoming, by G. H. Starr, plant diseases in Massachusetts, by O. C. Boyd; tobacco diseases in Maryland, by E. A. Walker; tobacco disease field survey in Wisconsin, 1937, by J. Johnson; rice diseases in Arkansas, by E. C. Tullis; cypress bark canker (*Coryneum cardinalis*) and the Monterey cypresses; *Cephalosporium* persimmon wilt, by B. S. Crandall; sweet corn bacterial wilt in Ohio; and scab on firethorn (*Pyracantha coccinea*).

No. 19.—Grain diseases in Georgia in 1937, by J. H. Miller; incidence of ear rots in the 1936 corn crop, by N. E. Stevens; tobacco field diseases in Florida, 1937, by R. R. Kincaid; *Phyllosticta juglandis* leaf spot of walnuts in Oregon, by P. W. Miller; and progress in Dutch elm disease eradication.

[Plant disease work by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 49–53, 55, 247, 248, 250, 251, 256, 257, 262, 263, 282, 283, figs. 3*).—Reports of progress are included on the following subjects: Tests of wheat varieties and strains for resistance to lodging, yellow leaf rust, and mosaic, by C. M. Woodworth and O. T. Bonnett; control of wheat mosaic, with varieties listed according to resistance and susceptibility, by B. Koehler and H. H. McKinney (cooperative with U. S. D. A.); seed treatments for oat smut, by Koehler; control of peach leaf curl by spraying, by S. C. Chandler; failure of weak bordeaux to protect against apple scab, possible value of zinc sulfate in control of apple scab and as a corrective for spray injury, and elimination of some suspected factors (e. g., negative results for common fungi and bacteria, soil reaction, and grafting and budding from diseased trees) in apple measles, all by H. W. Anderson; the development of strawberry varieties resistant to the fungus "brown stele" disease, by Anderson and A. S. Colby; and control of stem rot of *Euphorbia fulgens* by soil sterilization, by F. F. Weinard and S. W. Hall.

[Plant disease work by the Missouri Station] (*Missouri Sta. Bul. 387 (1937), pp. 31–34, 78, 104–108, fig. 1*).—Brief reports are included on the morphology and physiology of the genus *Phytophthora*, including new records for the State, by C. M. Tucker; tobacco mosaic and other virus diseases, by C. G. Vinson; *Fusarium* wilt of tomato, including tests of species and strains of hosts for resistance, by Tucker and G. W. Bohn; root rot of corn, by Tucker and C. G. Schmitt; and the control of smuts of small grains, with notes on fungi from barley seed and on the prevalence of powdery mildew of barley, by Tucker and J. J. White. Tucker also presents miscellaneous data on plant diseases, including a disease of sweet cherry trees in the nursery due to an organism resembling *Bacterium syringae* [=*Phytomonas syringae*]; trunk canker of cherry trees; a mushroom disease apparently of bacterial origin; and various notes on diseases identified during the year.

[Plant disease work by the North Carolina Station] (*North Carolina Sta. Rpt. 1934, pp. 35–37, 45, 46, 47, 61–66*).—Reports of progress are given on the following: Control of Granville tobacco wilt (*Bacterium solanacearum* [=*Phytomonas solanaceara*]) of potato, tomato, pepper, peanut, and tobacco, control of black root rot (*Thielavia basicola*) of tobacco, control of sweetpotato diseases, the effect of mercuric chloride on the control of *Ceratostomella fimbriata* (cause of black rot of sweetpotato), and control of arsenate of lead injury on the peach, all by R. F. Poole; tobacco mosaic, barley stripe and smut, and wheat rust, all by S. G. Lehman; control of root knot (*Heterodera radicicola*) on various crops; control of bacterial leaf spot (*B. pruni* [=*P. pruni*]) of the peach; and control of scab (*Cladosporium carpophilum*) and brown rot (*Sclerotinia fructicola*) on the peach, by K. J. Shaw.

Cellular nutrition and immunity, H. S. Reed (*3. Internatl. Cong. Compar. Path., Athens, 1936, vol. 1, Rpts., pt. 2, pp. 97–106, fig. 1; Fr. abs., p. 106*).—In this contribution by the University of California the author reviews the present status of our knowledge of cell organization and of hydration and nutritive processes in plants, with special reference to their relationships to immunity and susceptibility.

Biochemical and physical-chemical studies on the bacteria which stimulate atypical and pathological multiplication of plant cells, A. J. Riker (*3. Internatl. Cong. Compar. Path., Athens, 1936, vol. 1, Rpts., pt. 2, pp. 107–111; Fr. abs., p. 111*).—This contribution by the University of Wisconsin presents a résumé of the results of such studies, with particular reference to work by the author and his associates on *Phytomonas tumefaciens* [=*Bacterium tumefaciens*.]

Ascocalyx abietis and Bothrodiscus pinicola, J. W. Groves (*Mycologia, 28 (1936), No. 5, pp. 451–462, figs. 6*).—The genetic connection was established by cultures. *A. abietis* is believed to be closely related to, and congeneric with, fungi placed under *Crumenula* in the sense of H. Rehm.

Effect of inoculation of plant stems with Bacterium solanacearum, B. J. Grieve (*Nature [London], 137 (1936), No. 3465, p. 536*).—Petiole epinasty and adventitious root production were induced on tomato, potato, African marigold, and castor-oil plant, reactions closely similar to those induced by ethylene, carbon monoxide, and β-indolylacetic acid.

A microchemical colorimetric pH procedure for differentiating the telia of Cronartium ribicola and C. occidentale, R. J. Acree and W. H. Goss (*Jour. Agr. Res. [U. S.], 55 (1937), No. 5, pp. 347–352*).—Established methods failed to differentiate the telial stage of these two fungi. Studies involving pH reactions were made because of the minute differences that such methods reveal and with the hope that if such a difference existed it could be demonstrated unmistakably by color. Many exploratory experiments indicated that there is a definite and consistent but not easily demonstrated microchemical difference between the two species. The development of a treatment to amplify this difference and of an indicator solution to demonstrate it was accomplished by certain treatments with dilute acid, distilled water, and bromophenol blue under pH control.

These results are believed to point the way to a new field of study for the solution of similar problems.

Growth and development of Dictyostelium discoideum with different bacterial associates, K. B. Raper (*Jour. Agr. Res. [U. S.], 55 (1937), No. 4, pp. 289–316, figs. 4*).—This work was undertaken because of conflicting results by earlier students of the Dictyosteliaceae and the limited scope of their investigations. *D. discoideum* was found to grow regularly within the limits of bacterial

colonies, but the pseudoplasmodia typically leave the colonies in which they develop before forming sorocarps. During this migration they divest themselves of all bacteria. The organism was grown in association with a large number of saprophytic bacteria, including representatives of very diverse groups. In the majority of cases the bacterial colonies were completely consumed by the myxamoebae, and the amount of growth was usually proportional to the growth of the bacteria. There was no indication that the Dictyosteliaceae are regularly associated in nature with any particular species or group of bacteria. The myxamoebae of *D. discoideum* feed by ingestion and digestion of bacterial cells, and they can feed and develop normally on cells killed by heat or ultraviolet irradiation, though growth is a little less luxuriant in such cultures. A very meager and abnormal vegetative growth was obtained on pea-broth agar or on peptone-rich agar in the absence of bacteria. There was no indication that the bacteria gain anything from their association with the slime mold.

This species affords a particularly favorable organism for study of problems pertaining to the relation between small amoebae of the soil and the bacteria on which they feed. Species of this group may be capable of altering appreciably the bacteriological flora of decaying vegetation in soils.

Studies on the penetration of the haustoria of Peronospora brassicae Gaum. into the host tissue, H. T. CHU (*Jour. Agr. Assoc. China, No. 148 (1936), pp. 17–46, figs. 6; Eng. abs., pp. 38–40*).—Inoculation of eight crucifers with conidia indicated that the germ tubes penetrate the epidermis at the junctures between epidermal cells. Details are described and figured.

Venturia pirina.—I, The multiplicity of forms of the fungus [trans. title], W. HERBST (*Gartenbauwissenschaft, 10 (1936), No. 3, pp. 428–450, figs. 13*).—Several thousand single-spore cultures from different pear varieties and of different geographical origin were cultured on artificial media and their characters compared.

Venturia inaequalis.—V, Further investigations of the populations of the apple scab fungus living on various trees [trans. title], M. SCHMIDT (*Gartenbauwissenschaft, 10 (1936), No. 3, pp. 422–427, fig. 1*).—Among 473 isolations (over 90 being single-spore cultures from 5 apple trees) of *V. inaequalis*, 448 morphological types were differentiated. On the basis of these findings, together with the distribution and frequency of like types on different trees, the author concludes that no relations exist between the composition of the population living on any one tree and the type of the stand or the host tree.

Control of root-knot in Florida, J. R. WATSON and C. C. GOFF (*Florida Sta. Bul. 311 (1937), pp. 22*).—This bulletin presents pertinent data on the necessary conditions for nematode growth; their distribution and methods of spread; the host plants, including a relative-susceptibility list of common plants and a list of wild hosts; and control methods, with special reference to Florida conditions, including starvation (crop rotation), drowning, heat (dry, steam, and hot water), and chemicals. A concluding section discusses root knot on perennials, including fruit trees and ornamentals.

A virus infecting the Solanaceae and ornamental plants in the southwestern part of France [trans. title], M. SHAPOVALOV and J. DUFRENOY (*Compt. Rend. Soc. Biol. [Paris], 123 (1936), No. 31, pp. 696–698, fig. 1*).—Spontaneous infections of spotted wilt have been observed in this region in tomatoes and tobacco, and infected dahlias, surviving for several seasons, serve as reservoirs of the virus. In Europe the specific vector is *Thrips tabaci*. The symptoms and inoculation tests are briefly described. The cells of lesions are characterized by vacuolar inclusion bodies.

The heath-moor or reclamation disease, with special reference to the copper question [trans. title], B. RADEMACHER (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 4, pp. 531–603, figs. 11*).—This monograph considers the name of the disease and its history, its distribution geographically and by soil types, the causes, the significance of various growth factors for its appearance, the behavior of various crop and weed plants on soils predisposed to the affection, and the practical significance, prevention, and control of the disease, with special reference to copper metabolism. The specific cause of the malady is attributed to a deficiency of available copper in the soil.

A bibliography of 133 titles is included.

The water-binding power of peat and its relation to the so-called soil diseases (reclamation disease, etc.) [trans. title], T. ARND and H. SEGEBERG (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 43 (1936), No. 3–4, pp. 134–142, figs. 3*).—Three soil diseases are discussed, viz, the dry-spot disease (due to calcium injury), and Hooghalen disease (due to calcium deficiency), and the reclamation disease (occurring especially where humus is present in great quantity).

The influence of various substances on parasites: Bean rust and rust and powdery mildew of wheat [trans. title], C. SEMPIO (*Riv. Patol. Veg., 26 (1936), No. 7–8, pp. 201–278, figs. 22*).—The author reports tests of the effects of various chemicals (phenols, alkaloids, glucosides, enzymes, acids, metals, nutrient solutions at varying pH, hormones, vaccines, alcohol, ether, chloroform, and pyridine) administered via the plant roots on *Uromyces appendiculatus*, *Puccinia triticina*, and *Erysiphe graminis*.

Experiments on the use of lime in controlling finger and toe disease of Brassicae, T. WHITEHEAD (*Welsh Jour. Agr., 12 (1936), pp. 183–192*).—In 3 years' tests on badly contaminated soils of different types little direct relation was found between pH and degree of control, but there was a clear relation between amount of lime applied and control effected. Lime is believed to be directly lethal to the spores of the parasite.

Iodine and the control of fungal wastage, C. W. WARDLAW (*Trop. Agr. [Trinidad], 13 (1936), No. 5, p. 117*).—"The accumulated evidence shows that where fungal pathogens are still superficial or on the point of becoming established, iodized wraps [for fruits] may be used with advantage, but where the fungus has gained access to the tissues or is already present as a latent infection, the disorganizing effect of iodine on the tissue (with concomitant loss of resistance) may result in a marked increase in wastage."

Disease control with milder fungicides, W. C. DUTTON (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 20 (1935), pp. 188–191*).—This contribution by the Michigan Experiment Station gives a semipopular summary of results in that State, with particular reference to apple scab and spray injury.

The behavior of micro-organisms in the presence of certain dyes, with particular reference to malachite green and the possibility of phytotherapeutic applications [trans. title], O. VERONA (*Bol. R. Ist. Super. Agr. Pisa, 11 (1935), pp. 421–472, figs. 4*).—The inhibitory effects of organic dyes, and particularly of malachite green, were tested against a large number of bacterial and fungus species (including yeasts). The possible applications to seed treatment, to the control of downy mildew of grapes and other diseases, and to internal chemotherapeutic treatments are pointed out.

The eyespot disease of cereals, caused by Cercosporella herpotrichoides Fron, A. J. P. OORT (*Tijdschr. Plantenziekten, 42 (1936), Nos. 7, pp. 179–210, fig 8; 8, pp. 211–234, pls. 5; Eng. abs., pp. 225–228*).—This paper, the result of a 3-year investigation, discusses the literature, geographical distribution, symptoms, etiological relations, dissemination, host-parasite and environmental rela-

tions, and control (by direct methods, resistant varieties, and cultural methods) of a frequently occurring disease of wheat and barley in the Netherlands, due to *C. herpotrichoides*, which causes lodging and may bring about considerable losses.

Investigations of injury to cereals by Cercosporella herpotrichoides [*trans.* title], H. BOCKMANN (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 4, pp. 625–634, figs. 5*).—This disease, affecting wheat, barley, rye, and oats (the last only slightly), caused the most serious injuries in the field to winter cereals, those sown in summer remaining practically free of attack. The cause of this difference is attributed to the life history relations of the fungus rather than to any varietal resistance in the hosts.

The "Hooghalen" disease and the composition of cereal plants.—Preliminary report [trans. title], T. B. VAN ITALLIE (*Landbouwk. Tijdschr. [Wageningen], 48 (1936), No. 584, pp. 125–142, figs. 2; Ger. abs. pp. 140, 141*).—The data presented seem to relate the origin of this disease (with yellowish-green plants and striping of the leaf blades) to high soil acidity, defective mineral nutrition, and possibly to other factors. The most plausible explanation is believed to lie in a magnesium deficiency associated with unfavorable ion relations within the plant.

The nature of resistance of cereals to rust, E. C. STAKMAN and H. HART (*3. Internatl. Cong. Compar. Path., Athens, 1936, vol. 1, Rpts., pt. 2, pp. 253–266; Fr. abs., pp. 265, 266*).—This contribution by the University of Minnesota discusses the general principles involved in the rust resistance of cereals.

The inheritance of resistance to physiologic forms of Tilletia levis and T. tritici, and the effect of temperature on pathogenicity, W. K. SMITH (*Wash. State Col., Res. Studies, 3 (1935), No. 1, pp. 29, 30*).—This is an abstract of a dissertation from the State College of Washington, previously published in part (E. S. R., 70, p. 31; 71, p. 652).

Observations on dwarf or brown rust (Puccinia simplex) [=P. anomala] of barley [trans. title], E. RENNERFELT (*Sveriges Utsädesför. Tidskr., 45 (1935), No. 6, pp. 380–391, figs. 2*).—Various barley varieties and crosses are grouped into five classes according to their resistance or susceptibility to this rust, and the results of breeding and selection experiments are discussed and tabulated.

An inquiry into the causes of the gray leaf disease of oats [trans. title], F. C. GERRETSEN (*Dept. Landb. en Visch. [Netherlands], Verslag. Landbouwk. Onderzoek., No. 42 (1) A (1936), pp. 67, pls. 17; Ger. abs., pp. 65, 66*).—The author concludes that this disease (known to the Germans as "Dörrfleckenkrankheit") is to be considered a complex phenomenon, the appearance of which is determined not only by manganese deficiency but also bears a relation to the persence or absence of certain bacteria. The resistance of the oat roots to bacteria is related to the manganese content of the plant, and this in turn determines whether certain bacteria assume a saprophytic or a parasitic role.

Hot water disinfection of wheat seeds against loose smut (Ustilago nuda tritici Schaf.), R. VANDERWALLE and E. LAROSE (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 5 (1936), No. 1, pp. 74–88, fig. 1; Dutch, Ger., Eng. abs., pp. 86–88*).—Following presoaking at a minimum of 25° C., hot-water treatment at 52° proved necessary after less than 3 hr. of presoaking, at 50° after more than 3 hr., and at 48° after from 4.5 to 5 hr.

Mosaic diseases of wheat and related cereals, H. H. MCKINNEY (*U. S. Dept. Agr. Circ. 442 (1937), pp. 23, figs. 13*).—Mosaics of winter wheat are known in 44 counties of 7 States, and their distribution is becoming more extended each year. However, while they are very destructive under certain conditions, there is no cause for alarm because some of them may be controlled by resistant or

tolerant wheats. All tests have indicated that the viruses occurring east of the Mississippi River are carried in the soil, the new wheat crop becoming infected therefrom. Tests with soils from mosaic-infested areas west of the Mississippi River have given no such evidence.

Seven wheat mosaics considered to be distinct are described at temperatures near 60° F. under a daily photoperiod of 8 hr. These conditions are taken as standard because winter wheat responds in an essentially normal manner during tiller formation and because the mosaic symptoms are comparable to those occurring in the field during early spring growth. In some cases the viruses were purified from mixtures by selecting tissues or plants with symptoms differing from a given type and using these for virus in subsequent inoculations. Successive selection inoculations finally yielded viruses inducing the new symptoms with a high degree of regularity.

Investigations of the virulence of Ophiobolus graminis [trans. title], B. BUSSMANN (*Phytopath. Ztschr., 9 (1936), No. 6, pp. 571–581, figs. 5*).—Using special infection methods (described), several strains of *O. graminis* of different origin were tested. Extreme differences in the degree of their virulence were demonstrated.

The spread of take-all through the soil, D. B. ADAM and T. T. COLQUHOUN (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 4, pp. 172–174*).—The wheat plants in inoculated rows were, in general, severely affected and died as seedlings. Root infection by *Ophiobolus graminis* was demonstrated, and the results clearly indicate that the presence of living wheat roots influences the spread of take-all through the soil.

Effect of sulfur dioxide on wheat development: Action at low concentrations, R. E. SWAIN and A. B. JOHNSON (*Indus. and Engin. Chem., 28 (1936), No. 1, pp. 42–47, figs. 7*).—Wheat plants developed under controlled conditions favorable to growth tolerated exposure to sulfur dioxide concentrations below those at which typical foliar markings are produced without signs of injurious actions on their general appearance, growth rate, dry weight of tissues developed, or reproductive processes.

A response of alfalfa to borax, L. G. WILLIS and J. R. PILAND (*Science, 86 (1937), No. 2225, pp. 179, 180*).—An abnormal condition in alfalfa, conforming in all respects to descriptions of the supposedly transmissible "alfalfa yellows", is reported by the North Carolina Experiment Station to have been corrected during the same year by applications of borax in March at the rate of 5 lb. per acre, while similar treatment late in May produced no visible effect until the following year. A possible photoperiodic factor is suggested.

Halo blight of beans: Some relationships of the pathogen, A. T. PUGSLEY (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 1, pp. 30–32*).—This is a serologic and bacteriophagic comparison of *Phytomonas medicaginis phaseolicola* (=*Bacterium medicaginis phaseolicola*), *P. mori* (=*B. Mori*), and an unnamed bacterium from *Matthiola*.

A disease of Zea mays caused by Colletotrichum graminicolum (Ces.) Wils., S. C. CHOWDHURY (*Indian Jour. Agr. Sci., 6 (1936), No. 3, pp. 833–843, pls. 2, fig. 1*).—This fungus was isolated from diseased leaves of maize at Pusa, and its morphology, parasitism, cultural characters, and environal relations were studied and are here discussed.

Investigations on black-arm disease of cotton under field conditions.—I, The relation of the incidence and spread of black-arm disease of cotton to cultural conditions and rainfall in the Anglo-Egyptian Sudan, F. W. ANDREWS (*Empire Jour. Expt. Agr., 4 (1936), No. 16, pp. 344–356, figs. 7*).—Infective debris on adjacent fields of the previous season appears to be the main factor in

an outbreak of infection with *Pseudomonas malvacearum* [=*Phytomonas malvaceara*], and the sowing date affects the earliness of infection. Driving rains are the main vehicle of transmission from old to new fields.

Eremothecium ashbyii, a new fungus parasitic on cotton bolls [trans. title], A. GUILLIERMOND (*Rev. Mycol., n. ser., 1 (1936), No. 3, pp. 115–156, pls. 2, figs. 25*).—This reports a detailed study of the cultural, morphological, and cytological characters of *E. ashbyii*, its yellow pigmentation, and its affinities with other fungi (especially with *Ashbya gossypii*, to which it is closely related).

Potato scab and the heterolysis of the scab parasite [trans. title], K. T. WIERINGA and G. L. W. WIEBOLS (*Tijdschr. Plantenziekten, 42 (1936), No. 9, pp. 235–240, pl. 1*).—The authors discuss the agencies through which the actinomycete parasite may be inhibited in the soil, viz, by passive antagonism (through competition with other micro-organisms or through the formation of growth-inhibitory substances) and by active antagonism (through heterolysis by other micro-organisms or through the action of bacteriophages).

Contributions to the knowledge of the "bakanae" disease of rice plants [trans. title], F. SETO (*Mem. Col. Agr., Kyoto Imp. Univ., No. 36 (1935), pp. 81+VI, figs. 7*).—This is a monograph on the bakanae disease of rice, the name referring to the pathogenic acceleration of seedling growth typically induced by *Gibberella fujikuroi* (with *Fusarium* conidial stage). The text discusses in detail the successful isolation and inoculation experiments, the influence of soil temperature on the symptom complex, the host-parasite relations, and observations on the pathogenicity and general biology of the fungus and on influencing factors.

Rutabaga and turnip varietal susceptibility to bacterial soft rot disease, R. MAGRUDER and F. HEDGES (*Seed World, 42 (1937), No. 2, pp. 12, 13, figs. 2*).—An unusually severe epidemic of infection by *Bacillus carotovorus* [=*Erwinia carotovora*] in test plantings of 35 varieties of rutabagas and 11 of turnips served as a basis for the data here presented in tabular form. These led to the conclusion that there are evident differences in the extent of infection and rate of death among the different varieties and strains, though none were immune. Recommended control measures are given.

Experiments on the influence of nematodes on the yield and composition of sugar beets as affected by different fertilizer constituents [trans. title], edited by W. KRÜGER, G. WIMMER, and H. LÜDECKE (*Ztschr. Wirtschaftsgr. Zuckerindus., 85 (1935), Okt., Tech. T., pp. 583–603, pls. 20; Nov., Tech. T., pp. 623–679; Dez., Tech. T., pp. 717–761, pls. 10*).—This paper gives the results of a comprehensive series of pot experiments carried out during the years 1907 and 1910 and of field tests extending over 20 yr. relative to the mutual effects of nematode infestation and soil and fertilizer types and practices on the yield and composition of sugar beets.

Cercospora leaf-spot (frogeye) of tobacco in Queensland, A. V. HILL (*Austral. Council Sci. and Indus. Res. Bul. 98 (1936), pp. 46, pls. 7, figs. 6*).—The disease is due to *C. nicotianae*. It is stated that *C. raciborskii* and *C. solanicola* are synonyms, being morphologically indistinguishable and causing the same symptoms. The history, distribution, and economic importance are discussed, and detailed results of the present study are given, with descriptions of the fungus and the disease (including "barn spot," which is the form developed during the curing process from leaf infections incipient at harvesting time), the host range, the physiology and pathogenicity of the fungus, sources of infection, meteorological influences, and control measures.

Leaf curl of tobacco in southern Nigeria, J. WEST (*Trop. Agr. [Trinidad], 13 (1936), No. 9, pp. 242–244, pls. 2, fig. 1*).—The symptoms of this virus disease

are described and illustrated, and the relationships of its incidence in southern Nigeria with the white fly (*Aleurodidae*) vector and with seasonal conditions are discussed. Various precautions for its control are noted.

Tomato-seedling damping-off.—I, Control by soil-treatment, R. M. BRIEN and E. E. CHAMBERLAIN (*New Zeal. Jour. Agr.*, *52* (*1936*), *No. 5, pp. 257–267, figs. 5*).—This disease in New Zealand was shown to be due to *Pythium ultimum* and *Corticium vagum*, the injury and incidence of the former being greater. Stem disinfection and formalin treatment (1.25 percent solution) are recommended for control.

A possible acid seed soak for the control of bacterial canker of the tomato, H. L. BLOOD (*Science*, *86* (*1937*), *No. 2226, pp. 199, 200*).—In this Utah Experiment Station contribution, toxicity tests demonstrated an unquestionable toxic action of fermenting tomato fruit pulp upon the bacterial canker pathogen. Analysis of the fermented juices revealed that acetic and lactic acids were the acids formed most abundantly during fermentation. A preliminary test of the effectiveness of those acids, using in the case of acetic acid from 0.15 to 0.6 percent strength for from 3 to 96 hr., indicated that the acetic acid, when alone or in combination, offers promise as a safe and effective tomato seed soak for the control of bacterial canker. Further studies to establish limits of concentration and effective schedules for the treatment are reported as in progress.

Report of committee on fungous diseases of fruit, E. M. STODDARD (*Conn. Pomol. Soc. Proc.*, *44* (*1934*), *pp. 71–74*).—This contribution from the Connecticut [New Haven] Experiment Station places on record the incidence and injuries caused by the more conspicuous troubles of fruit in the State during 1934, including diseases of apple, peach, grape, cherry, pear, and strawberry, and winter injuries to various fruit trees during the 1933–34 winter.

Leptonecrosis of fruit trees and the behavior of some American varieties [*trans. title*], G. GORDÀNICH (*Italia Agr.*, *73* (*1936*), *No. 6, pp. 459–464, figs. 6*).—The distribution and damage caused in Italy by this phloem necrosis disease is discussed with special reference to American varieties of plums and apricots. Fungi, bacteria, the influence of climate or soil, and incompatibility of scion and stock are ruled out as causes, but the virus hypothesis is supported by various phenomena observed either in the type of pathological changes in affected trees or in the behavior of the latter in nature. Various attempts at transmission from diseased to healthy trees were made, with some indications of success. The elimination of affected varieties is recommended.

The existence of biological forms or races of Stromatinia fructigena and S. cinerea [trans. title], A. PESANTE (*Bol. Sez. Ital., Soc. Internaz. Microbiol.*, *7* (*1935*), *No. 10, pp. 383–389*).—Of numerous isolations from ripe fruits of apple, pear, peach, and quince in the fall and from dead twigs and withered flowers in the spring attacked by *Stromatinia*, almost all of the former group proved to be *S. fructigena* and of the latter group *S. cinerea*. In culture media the strains varied widely, and their differential characters persisted in the various media.

The brown rot diseases of fruit trees, H. WORMALD ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 88* (*1935*), *pp. V+50, pls. 28, figs. 2*).—This monograph discusses the history of this group of diseases; the nomenclature, geographical distribution, morphology, culture, and physiology of the brown rot fungi; con-
tions conducive to infection; mode of entry into the host; related fungi;
The r from brown rot; host plants (apple, pear, plum, cherry, peach and nec-
cultural apricot, and quince and medlar); and control. Over five pages of
DREWS (En references are included.
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Studies on the young fruit-rot of apple-tree, Y. SHIMA (*Jour. Faculty Agr., Hokkaido Imp. Univ., 39 (1936), No. 3, pp. 143–270, pls. 7*).—In this monograph are presented, in English, a historical review (with 157 bibliographic references), a general description of the disease and its fungus agent (*Sclerotinia mali*), the author's studies relative to stigma infection and the behavior of the fungus hyphae and pollen tubes in the pistil tissues, and theoretical and experimental considerations on the prevention of rot in the immature fruit and of the axis-blight phase of the disease.

Recent developments in control of graft knots on nursery apple trees, A. J. RIKER (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 956–960, figs. 5*).—This contribution from the Wisconsin Experiment Station is condensed from a paper given December 30, 1935, before the plant quarantine and inspection section of the American Association of Economic Entomologists. The essential data have been noted previously (E. S. R., 71, p. 800).

Some apple disease problems in New Jersey in 1936, W. H. MARTIN (*N. J. State Hort. Soc. News, 18 (1937), No. 3, pp. 900, 901, 910*).—This paper from the New Jersey Experiment Stations summarizes the 1936 conditions and work in the State relative to scab (including the time of application of critical sprays, dates of scab maturity with tabulations for 1927–1936, and some results of spraying for scab), spray burn (incidence and factors favoring and preventing it), progress with copper fungicides, and methods of decreasing copper injuries.

Leaf injection, W. A. ROACH (*East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 134–136, figs. 2*).—The leaves of a potted pear tree with severe chlorosis were injected with various solutions by holding the cut tips of each under the surface of the liquid held in a suitable container. The tree was finally cured by injecting a solution of ferric tartrate through a hole passing through its main stem. It is suggested that similar deficiency diseases could be diagnosed and cured within 3 weeks.

The gumming of Phillips Cling peaches, L. D. DAVIS (*Hilgardia [California Sta.], 11 (1937), No. 1, pp. 34, figs. 22*).—At least four types of gumming occur on this variety, differing in place of occurrence on the fruit, time of appearance during its development, and economic importance. Their probable physiological nature is discussed. Three of them (the early suture, dorsal and distal, and late ventral) occur at a definite time in the fruit development. Gumming, splitpit, and embryo abortion are closely associated, and splitpit and embryo abortion of nongummy fruits are apparently correlated with a tendency to produce gumming in the tree from which they came. Counting the number of gummy fruits that could be seen from the ground was found to be a very satisfactory method of obtaining data, especially with large numbers of trees. A delay of thinning until about 5 weeks after the pit begins to harden on the tip has resulted in satisfactory elimination of affected fruit.

False blossom, C. S. BECKWITH (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 65 (1935), pp. 25, 26*).—This contribution from the New Jersey Experiment Stations is a plea for the control of the false blossom disease of cranberries, with recommendations.

A new fungus in the roots of grapevines affected with the brushwood disease [trans. title], H. R. BODE (*Ber. Deut. Bot. Gesell., 54 (1936), No. 9, pp. 542–555, figs. 4*).—*Rhizomyxa viticola* n. sp. is described as found invading the roots of grapevines affected with the brushwood disease.

New observations on the medullary disease (parasitic court-noué) [trans. title], P. VIALA and P. MARSAIS (*Rev. Vitic., 84 (1936), No. 2176, pp. 169, 170*).—The authors present a brief summary of confirmatory data accumulated by

themselves and received from others since the publication of their monograph on this disease of grapevines, the cause of which they attribute to the fungus *Pumilus medullae* (E. S. R., 75, p. 222).

Aphis resistance in breeding mosaic-escaping red raspberries, C. D. SCHWARTZE and G. A. HUBER (*Science, 86 (1937), No. 2224, pp. 158, 159*).—In experiments at the Western Washington Experiment Station the Lloyd George variety was found to escape red raspberry mosaic infection completely by virtue of its resistance to the aphid vector, *Amphorophora rubi*, and to transmit this characteristic when hybridized with a susceptible variety. In a 3-yr. study, no effective vector other than *A. rubi* was found upon the red raspberry. Antwerp, Herbert, and Newburgh showed marked resistance to the vector, while the other varieties, except Lloyd George, showed greater susceptibility, the rate of spread of mosaic appearing to be directly proportional to their relative aphid populations. Artificial infection by graftage indicated, however, that Lloyd George is susceptible to the virus. In greenhouse experiments, stem mothers were placed upon individual plants under cheesecloth cages. Large populations developed upon highly susceptible varieties; little reproduction occurred upon more resistant varieties; and on Lloyd George they gradually died without reproducing after wandering about apparently without feeding. Six hybrids of Lloyd George × Cuthbert, or the reciprocal, out of 31 were completely resistant and several others highly resistant to the insect. Three out of 6 Lloyd George × Latham hybrids, or the reciprocal, were resistant and 3 susceptible. Of 19 hybrids of susceptible parents, all were definitely susceptible. The behavior of *A. rubi* when confined to Lloyd George plants under cages indicated that resistance probably results from a lack of suitable food for the insect rather than the presence of an actively repellent substance.

Avocado spraying results for 1934, H. E. STEVENS (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 130–132*).—This is a progress report on spraying results with special reference to *Cercospora* spotting, as indicating that an early application of 4–4–50 bordeaux mixture will be needed to protect certain varieties from heavy summer or fall drop that might be caused by infected stems. This applies more particularly to varieties with long, slender stems, and to those more susceptible to *Cercospora* and anthracnose attacks.

Protection of citrus fruits and foliage from brown rot, H. S. FAWCETT and L. J. KLOTZ (*Calif. Citrogr., 22 (1936), No. 2, pp. 64, 65, fig. 1*).—This summary of recommended control measures is a contribution from the California Citrus Experiment Station.

Studies on the infection of citrus fruits.—I, Some methods of infection by the green mould, Penicillium digitatum, Sacc., G. R. BATES (*Brit. So. Africa Co. Pub. 4 (1936), pp. 83–101*).—The experiments discussed included differential inoculation into the rind by dry spores, promotion of infection by wounds made between the oil vesicles, infection by inoculations into the oil vesicles, stem-end infection, infection through the uninjured rind, and prevention of infection by wilting or curing to toughen the rind.

Fungal invasion of navel oranges, R. DAVIES (*Union So. Africa Dept. Agr. and Forestry, Rpt. Low Temp. Res. Lab., Capetown, 1933, pp. 114–120, fig. 1*).—*Penicillium digitatum*, responsible for the predominant part of the wastage in South African citrus fruits during transportation, was used in this study of the course of fungal invasion and of the factors influencing it (e. g., variations in resistance in relation to origin of the fruit, to wilting and storage, to fertilizers, and to chemical composition of the fruit).

Gummosis of citrus in Bombay, B. N. UPPAL and M. N. KAMAT (*Indian Jour. Agr. Sci., 6 (1936), No. 3, pp. 803–822, pls. 3, figs. 2*).—The disease is

shown to be due to *Phytophthora palmivora*. Pomelos and oranges proved susceptible, a horticultural variety each of lime and lemon was almost immune, and the common tangerine was intermediate in its reaction to the disease. Grafting of susceptible varieties on resistant stock is recommended. The best method of treatment found was to remove the bark from affected parts and to cover the wound with creosote oil.

The production of citrus mottle-leaf in controlled nutrient cultures, H. D. CHAPMAN, A. P. VANSELOW, and G. F. LIEBIG, JR. (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 5, pp. 365–379, figs. 6*).—In this study by the California Experiment Station, citrus cuttings, grown in solution cultures in which special efforts were made to reduce zinc contamination, developed mottle-leaf in a growing period of less than 2 mo. No mottle-leaf appeared in cultures to which zinc had been added. Addition of zinc to cultures in which mottle-leaf had developed caused the condition to disappear. Citrus plants grown under the full light of the greenhouse (about 80 percent of the outside illumination) became more severely mottled than those subjected to a lower light intensity (about 40 percent). Mottle-leaf was accentuated by increasing the phosphate concentration of the nutrient medium, this effect probably resulting from zinc phosphate reactions within the plant.

The results obtained are believed to be more in harmony with the view that zinc is an indispensible plant food element, citrus mottle-leaf being a manifestation of its deficiency, than that it functions as an antiseptic or corrective.

Phytophthora stem and tip blight of citrus seedlings, J. PERLBERGER (*Hadar, 9* (*1936*), *No. 6–7, pp. 145–150, figs. 9*).—Both *P. parasitica* and *P. citrophthora* were proved to be involved, and two other Phytophthoras, as yet not identified, were also found in diseased sweet lime seedlings in Palestine. Seedling infection was obtained via the soil. The brown rots following inoculations of the two species into fruits are differentiated. The relative resistance of citrus species, factors influencing infection, the damage caused, and control measures are also discussed. A list of literature references is added on page 130 of the Hebrew text.

How to improve the quality of citrus fruit we grow and ship: A symposium.—III, Viewpoint of the plant pathologist, H. S. FAWCETT (*Calif. Citrogr., 21* (*1936*), *No. 12, p. 459, fig. 1*).—This contribution by the California Citrus Experiment Station briefly outlines the relations of diseases to the appearance and keeping quality of citrus fruits under the conditions in this State.

A preliminary report on the control of leaf chlorosis of grapefruit in Puerto Rico, J. H. JENSEN (*Puerto Rico Sta. Agr. Notes No. 82* (*1937*), *pp. 5*).—In tests here reported the zinc sulfate (7–100) sprayed trees showed marked recovery within 3 weeks after treatment, while no benefits were obtained with iron sulfate, manganese sulfate, or copper sulfate sprays. There was no correlation of chlorosis incidence with soil reaction, the trouble occurring on acid, neutral, and alkaline soils. The disease and its economic significance are discussed in general.

On Verticillium wilt of the perpetual-flowering carnation, H. L. WHITE (*Jour. Pomol. and Hort. Sci., 14* (*1936*), *No. 3, pp. 216–226*).—The author reports confirmation that this disease is carried through the cuttings and that there is evidence of a differential susceptibility of varieties toward *V. cinerescens* strains. Attempts to infect tomatoes, chrysanthemums, and asters failed.

Control measures are discussed.

Detection of spotted wilt virus in chrysanthemums, G. C. AINSWORTH (*Nature* [*London*], *137* (*1936*), *No. 3473, p. 868*).—Chrysanthemums being

susceptible to infection with the virus of spotted wilt of tomatoes and strong circumstantial evidence implicating them in outbreaks in tomatoes, detection of the disease in chrysanthemums assumes great importance but unfortunately the symptoms are often indefinite and mild. The author found that an aqueous extract of healthy chrysanthemum leaves added to an extract of spotted wilt leaves inactivated the virus, while sodium sulfite added to a virus-containing extract greatly prolonged the activity. When parallel halves of infected chrysanthemum leaves were ground up in 0.5 percent sulfite solution and in water, respectively, the former extract caused the development of lesions in tobacco while the latter did not.

A latent virus of lily, F. P. McWhorter (*Science, 86 (1937), No. 2225, p. 179*).—This paper announces that tulip virus 1 is widely distributed in bulb-perpetuated lilies. This is the color-removing virus of tulips which plays the leading role in the complex virus disease known as tulip-breaking. In some lily species it is latent. Another tulip virus is reported as sometimes present in both obviously diseased and apparently healthy lilies. Three years' inoculations from apparently healthy bulb-perpetuated lilies to Clara Butt and other varieties of tulips have induced extreme forms of tulip-breaking. The lily species in which latent viruses have been demonstrated are *Lilium tigrinum*, *candidum*, and *longiflorum*. Inoculations with juice from *longiflorum* seedlings have shown that they do not contain this latent virus.

Shade tree diseases of Michigan, F. C. Strong (*Natl. Shade Tree Conf. Proc., 12 (1936), pp. 103–110*).—This contribution from Michigan State College calls attention to some of the outstanding tree disease problems of the State encountered during the past few years. These include parasitic diseases, chlorosis, winter injury, various troubles due to lack of sufficient soil moisture, and injuries by the run-off from applications of calcium chloride and oils to highways.

Shade tree diseases of New England, M. A. McKenzie (*Natl. Shade Tree Conf. Proc. 12 (1936), pp. 100–103*).—This contribution from Massachusetts State College briefly discusses "current events in New England tree diseases."

The Dutch elm disease in Belgium [trans. title], M. Boudru (*Bul. Soc. Cent. Forest. Belg., 42 (1935), No. 12, pp. 508–522*).—The author reports on the distribution and spread of the disease in Belgium, on studies of the biology of *Ceratostomella ulmi*, and on tests with various preventive or curative treatments. Injection of certain agents (malachite green, sunoxol, and chinosol), as tested in the laboratory, gave some promise. The American elms have proved extremely susceptible and the European forms receptive, but some of the Asiatic varieties have appeared resistant or immune.

Oriental plane tree disease, D. R. Sumstine (*Science, 84 (1936), No. 2176, p. 247*).—Attention is called to the occurrence on the leaves of *Platanus orientalis* in Pennsylvania and New Jersey of white floccose patches of a fungus similar to or identical with *Oidium obductum*, the conidial stage of *Phyllactinia corylea angulata*.

Pathological studies on beech at the Arnold Arboretum, J. H. Faull (*Natl. Shade Tree Conf. Proc., 12 (1936), pp. 21–28*).—This is an address summarizing work on the Nova Scotia disease—a *Nectria* disease of the bark of beech trees following infestations with an introduced "woolly" bark louse (*Cryptococcus fagi*), cankers caused by the two-lined chestnut borer (*Agrilus bilineatus*), and heart rot due to *Fomes fomentarius*.

Polyporus hispidus and a canker of oaks, B. Sleeth and C. B. Bidwell (*Jour. Forestry, 35 (1937), No. 8, pp. 778–785, figs. 2*).—"*P. hispidus* has been recognized as a serious heartwood-rotting fungus for many years. Evidence is submitted that an important canker of oaks also is caused by this fungus. A

study of an area in Connecticut showed that 2 percent of the white oak, 8 percent of the chestnut oak, and 13 percent of the black oak had cankers. The average total loss resulting from the cankers amounted to 2 percent of the cordwood volume and 3 percent of the board foot volume. In a selected 0.1-acre plat the loss amounted to 29 percent of the cordwood volume and 33 percent of the board foot volume. Felling and, where possible, utilizing infected trees is the best method of control."

The principal rots of English oak, K. St. G. Cartwright and W. P. K. Findlay (*London: Dept. Sci. and Indus. Res., 1936, pp. V+38, pls. 13, figs. 2*).—"The main object of the present publication is to provide a concise survey of the existing information and of recent work carried out at the Forest Products Research Laboratory on the principal rots of English oak, giving descriptions of the fungi adequate for their recognition and identification without entering into too much detail concerning their microscopic characters."

The course and result of the investigation of blister rust [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 2, pp. 49–103, figs. 5*).—This is a comprehensive, critical review of the history and published results of investigations of this disease, due to *Cronartium ribicola*.

Susceptibility to Cronartium ribicola of the four principal Ribes species found within the commercial range of Pinus monticola, J. L. Mielke, T. W. Childs, and H. G. Lachmund (*Jour. Agr. Res. [U. S.], 55 (1937), No. 5, pp. 317–346, figs. 6*).—These investigations were undertaken to determine the susceptibility and telium-producing capacity of the four principal *Ribes* species (*R. petiolare*, *R. inerme*, *R. viscosissimum*, and *R. lacustre*) in northern Idaho, northeastern Washington, and western Montana as a preliminary measure of their pine-infecting power. New systems of recording data, developed to meet the needs, are described. The studies (7 yr.) were conducted under natural conditions and included 7,018 tests of nearly 4 million leaves. *R. petiolare* proved extremely susceptible, approaching cultivated black currant in both severity of infection and production of telia. *R. inerme* was also highly susceptible, under very favorable conditions equaling or surpassing *R. petiolare* in extent of infection and bearing abundant telia when growing in the shade. *R. viscosissimum* and *R. lacustre* were more resistant. The latter occasionally became moderately infected, but was nearly always low in production of telia. From the standpoints of density and size of telial columns the relatively greater teliospore production and potential danger of *R. petiolare* and *R. inerme* to associated pines appear even more pronounced. Infection was heavier and telia were more abundant on plants in the shade than in the open. Data on average infection, telium production, and teliospore production are given for open, shade, and part-shade forms of each species. The effect of weather and other environmental factors on relative susceptibility and telium production are discussed. There appeared to be rather wide variation (affected by inherent differences) in susceptibility among individuals of the same species and form.

The identification, detection, and culture of wood-staining and wood-destroying fungi, W. Bavendamm (*Erkennen, Nachweis und Kultur der holzverfärbenden und holzzersetzenden Pilze. Handbuch der biologischen Arbeitsmethoden, Abt. XII, Teil 2, Heft 7. Berlin and Wien (Vienna): Urban & Schwarzenberg, 1936, XII, pt. 2, No. 7, pp. 927–1134, figs. 47*).—In this monograph the subject is discussed under the macroscopic identification of fungus-infected wood in living trees and in timber (general considerations, keys to the most important wood-staining and wood-destroying fungi, the physical and mechanical properties of wood, and bioluminescence), and the microscopic and

chemical demonstration of fungus diseases of wood. The bibliography covers 14 pages.

The feeding of the root-knot nematode in root tissue and nutrient solution, M. B. Linford (*Phytopathology, 27 (1937), No. 8, pp. 824–835, figs. 2*).—It was found through this study by the Hawaii Pineapple Experiment Station that the larvae and young females in thick sections of live roots turn the head freely within the tight socket formed by the giant-cell group and thrust the stylet freely, penetrating all cells within reach in irregular rotation for brief feeding, which avoids destruction of the cells and so maintains, for a long period, an immediately accessible and abundant food supply. The significance of these observations is discussed in relation to other stylet-bearing nematodes and to the biology and pathogenicity of this species.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A biological study of German bats [trans. title], M. Eisentraut (*Kleintier u. Pelztier, 13 (1937), No. 4, pp. [7]+184, figs. 59*).—This study of bats in Germany, of which 19 forms are listed, is presented with a 7-page list of references to the literature.

Some experiments with rats and rat guards, O. E. Denney (*Pub. Health Rpts. [U. S.], 52 (1937), No. 23, pp. 723–726, pls. 8*).—The work reported shows that a poor rat guard will not deter a rat, and that the usually accepted type of guard probably will not deter a determined rat with an active migratory urge.

Some longevity records of wild birds, M. T. Cooke (*Bird-Banding, 8 (1937), No. 2, pp. 52–65*).—A report of a cursory study of the banding returns received by the U. S. D. A. Bureau of Biological Survey during the last 3 yr., duck records being reserved for a separate report. No birds less than 5 yr. old at the latest date of recovery are included, and no attempt has been made to complete the records of returning individuals.

Food and feeding habits of the tree sparrow, A. M. Baumgartner (*Wilson Bul., 49 (1937), No. 2, pp. 65–80, figs. 4*).—In this contribution the author assembles the known data concerning the food and feeding habits of the tree sparrow (*Spizella arborea*), summarizing and amplifying the standard publications by more recent papers and by personal investigation at Churchill, Manitoba.

Enemies and survival ratio of the tree sparrow, A. M. Baumgartner (*Bird-Banding, 8 (1937), No. 2, pp. 45–52*).—In this contribution an attempt has been made to list and evaluate the known forces which affect the populations of the tree sparrows.

Parasitism of bird's nests by Protocalliphora at Groton, Massachusetts, E. A. Mason (*Bird-Banding, 7 (1936), No. 3, pp. 112–121*).—Observations of the parasitism of nestlings by dipterous parasites of the genus *Protocalliphora*, including case records and the building up of a large population of the secondary chalcid parasite of the genus *Mormoniella*, are reported upon. Reference is made to the work of Johnson previously noted (E. S. R., 62, p. 455).

Methods in the protection and harvesting of shellfish, T. C. Nelson (*Pub. Health News [N. J.], 21 (1937), No. 3, pp. 76–79*).—In this contribution from the New Jersey Experiment Stations, a brief account is given of the methods of growing, harvesting, and preparing oysters and clams for market.

The use of logarithms in the interpretation of certain entomological problems, C. B. Williams (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 404–414, figs. 4*).—Contributing from the Rothamsted Experimental Station, "evidence is

brought forward that in comparing the numbers of insects caught under varying conditions, with particular reference to captures in a light trap, more consistent results are obtained if the geometric means are compared than by the use of arithmetic means. This is most conveniently done by summing the logarithms of the numbers instead of the numbers themselves. If any of the numbers in the series is zero it has been found practical to add one unit to all the captures in the series and so deal with log $(n+1)$ instead of log n.

"The use of the logarithms prevents the swamping of the results in a series of observations by very high numbers on a single night. It also gives a more normal distribution of departures from a mean. As a result of the latter it is possible to apply the statistical formulas for standard deviation, etc., which are not applicable to the skew curve obtained by the use of the departures of the numbers themselves from an arithmetic mean."

The food of insects and its relation to resistance of plants to insect attack, R. H. PAINTER (*Amer. Nat., 70 (1936), No. 731, pp. 547–566*).—In contributing from the Kansas Experiment Station it is pointed out that the actual nutritive substances used by phytophagous insects in contrast to the plant parts which they eat is a factor of great importance in insect biology and entitled to as thorough and accurate a study as that which has been given to humidity and temperature. At present the rate and extent of insect development is the only available measure of the food value of a plant to an insect, and it differs even within plant varieties. The factors involved in the resistance of plants to insect attack are outlined and discussed under the headings of (1) evasion—transitory or pseudoresistance by avoidance, (2) resistance and tolerance (largely genetic), and (3) immunity (largely genetic). The contribution is accompanied by a list of 39 references to the literature.

Toxicological study of derris, A. M. AMBROSE and H. B. HAAG (*Indus. and Engin. Chem., 28 (1936), No. 7, pp. 815–821, fig. 1*).—The experimental results obtained in a study of the acute oral toxicity of several samples of derris containing varying percentages of rotenone, together with the determination of the toxicity of extracts of derris for mammals, are reported. The data show that the rotenone content of derris is no reliable index of its toxicity, since, as a stomach poison, derris is more toxic than rotenone.

"Studies on the toxicity of derris by inhalation for various laboratory animals indicate that it is extremely more toxic than when administered orally, suggesting a possible health hazard to those engaged in milling, grinding, and diluting derris without the use of suitable protective measures.

"Pharmacological studies are presented, showing that the probable site of action of derris and water extracts of derris is upon the respiratory center, regardless of the mode of administration."

A list of 23 references to the literature is included.

Toxicity of derris and cube, J. A. MATHEWS and H. D. LIGHTBODY (*Indus. and Engin. Chem., 28 (1936), No. 7, pp. 812–814*).—When extracts from derris or cube root powders were fed to rats in olive oil solution the toxicity was greater than would be expected on the basis of the rotenone content, indicating that there may be present substances other than rotenone which are physiologically active.

"The relations between the toxicity of extracts and rotenone content vary with the solvent used and with the sample of derris from which they are prepared. Acetone and ether extracts are about equally toxic, and these solvents appear to remove completely the active substances. Carbon tetrachloride likewise appears to remove completely the toxic agents but with partial loss of physiological activity. Olive oil fails to remove completely the principle from

the powders, but does markedly accentuate the toxic properties if the reagents are extracted by acetone or ether and subsequently fed in oil solution.

"Rotenone content is not a measure of toxicity of derris when administered orally to warm-blooded animals. The possible presence of still other substances that may be injurious is discussed."

Toxicology of rotenone, H. D. LIGHTBODY and J. A. MATHEWS (*Indus. and Engin. Chem., 28 (1936), No. 7, pp. 809–811*).—Studies are reported, with details in four tables, indicating that when administered orally rotenone dissolved in oil is much more toxic than when given as the solid or in suspension. "The oral minimum lethal dose for white rats is about 25 mg per kilogram, and for guinea pigs 12 mg per kilogram. The toxicity of rotenone ingested orally depends upon the physical state of the compound. Finely divided rotenone is more toxic than coarse crystals. The toxicity of solid rotenone is increased by feeding fats, the increase being roughly parallel to the amount of fat ingested. When sublethal doses of rotenone are given daily in olive oil, the total dose received before death is larger than the acute toxic dose by an amount which varies in inverse order with the size of the daily dose. This is taken to indicate that there is a partial elimination or detoxification of the rotenone, and either that the compound accumulates in an active form in the tissues or that the injuries are additive."

The toxicity of hydrogen cyanide to certain wood-boring insects, E. A. PARKIN and J. R. BUSVINE (*Ann. Appl. Biol., 24 (1937), No. 1, pp. 131–143, figs. 2*).—The relation of this investigation to other problems connected with wood fumigation is indicated, and previous work on the subject is reviewed.

"The technic is described by which the toxicity of hydrocyanic acid gas to certain wood-feeding insects has been determined under standard conditions. Results of experiments with *Lyctus* sp. larvae at 20° and 25° C. and with *L. brunneus* beetles and *Anobium punctatum* larvae at 25° are given, and resistance curves for different concentrations and exposures drawn from them. The relative resistances and the toxicity relationships of the different insects are discussed. Experiments with *Lyctus* larvae at 20° and 25° show that the insects are more susceptible to HCN at the higher temperature. At 25° *Lyctus* larvae are more susceptible to HCN than *Lyctus* beetles or *Anobium* larvae."

A biological study of the fumigation of empty warehouses with hydrogen cyanide and ethylene oxide, C. POTTER (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 415–441, figs. 3*).—The author reports upon the fumigation of a number of empty warehouses, aimed at killing the hibernating larvae of the tobacco moth and the Indian-meal moth that were present in the fabric of the warehouse. The first sheds were fumigated with Etox (ethylene oxide with 10 percent carbon dioxide), the rest with hydrogen cyanide. An account is given of the factors involved in making a biological test of a fumigation. The effect of the fumigation was studied by (1) its action on test insects placed in various positions in the warehouse, and (2) an examination of the warehouse to discover how the insects present in situ had been affected. The actual measured concentrations of fumigant are given for the positions where insects were examined. The results are given of a laboratory experiment on the action of hydrogen cyanide on the hibernating larvae of the tobacco moth and the Indian-meal moth, which amplify the results obtained in the warehouse. An analysis of the results obtained is given, together with a summary of the results of other workers. A list is given of 36 references to the literature.

[Contributions on economic insects] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Insect Pest Survey Bul., 14 [1934], No. 9, Sup., pp. 299–324; 15 [1935], Nos. 2, Sup., pp. 59–61, pls. 3; 3, Sup., pp. 103–109; 16 (1936), Nos. 1, Sup., p. 25,*

pl. 1; 4, Sup., pp. 149–156; 5, Sup., pp. 213–259).—These contributions are, respectively, as follows: The Species and Distribution of Grasshoppers Responsible for the 1934 Outbreak, by R. L. Shotwell; The Two Broods of Periodical Cicada Scheduled to Appear in 1935; Trial Surveys of Chinch Bugs in Hibernation, November 1934 to March 1935, by C. M. Packard, C. Benton, et al.; Chinch Bug Abundance in Hibernation Quarters, November-December 1935, by C. M. Packard; Results of European Corn Borer Surveys in Thirteen Selected Counties, 1935, by L. H. Worthley; and The Species and Distribution of Grasshoppers in the 1935 Outbreak, by R. L. Shotwell.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1937. E–404, pp. 12, pls. 4; E–405, pp. 7, pls. 3; E–406, pp. 3, pl. 1; E–407, pp. 2; E–408, pp. 27; E–409, pp. 7, pl. 1; E–410, pp. 5, pl. 1; E–411, pp. 3, pls. 3; E–412, pp. 3; E–413, pp. 11; E–414, pp. 4, pl. 1; E–415, pp. 2; E–416, pp. 11; E–417, pp. 8, pl. 1*).—The following contributions are in continuation of this series (E. S. R., 77, p. 214): Current Research on Quarantine Aspects of the Alfalfa Weevil Problem, by J. C. Hamlin and R. W. Bunn (E–404); Recent Advances in the Vacuum Fumigation of Cereal Products With Certain Fumigants, by R. T. Cotton, G. B. Wagner, and H. D. Young (E–405); A Round Vat for Dipping Goats and Sheep, by O. G. Babcock (E–406), in cooperation with the Texas Experiment Station; Infestation in Stored Raisins, by P. Simmons and H. C. Donohoe (E–407); The Arsenates of Manganese as Insecticides: A Review of the Literature, by F. E. Dearborn (E–408); A Method for Preventing Insect Injury to Material Used for Posts, Poles, and Rustic Construction, by F. C. Craighead, R. A. St. George, and B. H. Wilford (E–409); Insecticidal Treatment of Early Market Sweet Corn Infested by the European Corn Borer, by C. H. Batchelder and D. D. Questel (E–410); Shade Cloth for Excluding Insects from Drying and Dried Fruits, by P. Simmons, H. C. Donohoe, D. F. Barnes, and C. K. Fisher (E–411); Danger of Transferring Local Sugarcane Pests to Uninfested Areas in the United States, by J. W. Ingram (E–412); The Tolerance of Sweet Corn to Spreading Agents, by C. H. Batchelder, D. D. Questel, and N. Turner (E–413), in cooperation with the Connecticut [New Haven] Experiment Station; Infestation in Raisins and Its Control, by P. Simmons, H. C. Donohoe, D. F. Barnes, and C. K. Fisher (E–414); Silverfish [the Silverfish and the Firebrat], by E. A. Back (E–415); Investigations of the Varietal Resistance of Field Corn to the European Corn Borer in 1936, by L. H. Patch and G. T. Bottger (E–416); and Keys to the Larvae of 4 Groups of 43 Species of the Genus *Phyllophaga*, by A. G. Böving (E–417).

[Contributions on economic entomology] (*Ztschr. Angew. Ent., 23 (1936), Nos. 1, pp. 176, figs. 58; 2, pp. 177–331, figs. 68; 3, pp. 339–484, figs. 51; 23 (1937), No. 4, pp. 531–652, figs. 64*).—The entomological contributions here presented (E. S. R., 75, p. 656) include:

No. 1.—Experimental Investigations of the Effect of Mass Breeding on the Individual Insect, by E. Titschack (pp. 1–64); Contributions to the Knowledge of the Biology, Economic Importance, and Control of *Kakothrips robustus* Uz., by C. Buhl (pp. 65–113); Descriptions of New Genera and Species of the Family Trichogrammidae (Hym., Chalcidoidea) From the Palearctic Region, With Notes, II, by Š. Nowicki (pp. 114–148) (in English) (E. S. R., 73, p. 644); Factors Regulating Population and Their Correlation in Bark Beetles [*Ips typographus*]: A Critical Discussion of the Work of M. Seitner et al., by K. E. Schedl (pp. 149–173); and Concerning the Contribution of Germar [E. S. R., 75, p. 657]: Experiments on the Control of the Granary Weevil With Dust Insecticides, by G. Kunike (pp. 174–176).

No. 2.—Contributions to the Knowledge of the Pest Fauna of Asia Minor [Anatolia]—III, The Beet Armyworm (*Laphygma exigua* Hübn.), a Major Pest of Sugar Beet in Anatolia, by P. Steiner (pp. 177–222) (E. S. R., 69, p. 233); The Present Economic Importance of the Apple Blossom Weevil *Anthonomus pomorum* L., by M. Klemm (pp. 223–264); Predisposing Factors and Infection by Lac and Other Scale Insects, by S. Mahdihassan (pp. 265–280) (in English); Wood-Destroying Longicorn Beetle Larvae: *Ergates faber* L., *Leptura rubra* L., and *Hylotrupes bajulus* L., by K. Eckstein (pp. 281–293); The Influence of Temperature and Colored Illumination on the Development and Morphological Characters of the Aphid *Lipaphis cresimi* Kalt., by N. P. Sokolov (pp. 294–302); Contributions to the Biology and Control of the Granary Weevil (*Calendra granaria* L.) (Curculionidae), by G. Kunike (pp. 303–326); Reply to the Comment of G. Kunike [see above] on the Contribution "Experimental Control of the Granary Weevil With Dust Insecticides", by B. Germar (pp. 327–329); and Supplementary Note on the Animal Pests of Asparagus, by M. Dingler (pp. 330, 331) (E. S. R., 75, p. 656).

No. 3.—Contributions to the Knowledge of the Pest Fauna of Asia Minor [Anatolia]—IV, *Bothynoderes punctiventris* Germ. as an Enemy of Sugar Beet in Turkey, by P. Steiner (pp. 339–369) (see above); Life History and Control of the Stalk Flea Beetle *Chaetocnema aridula* Gyll., by W. Ripper (pp. 370–416); The Life History of the Common Rootstalk Maggot in Midsummer; A Contribution to Its Biology in Central Europe, by O. Watzl (pp. 417–431); and Contributions to a Monograph of the Lepidopterous Larvae With Urticating Hair, by H. Weidner (pp. 432–484).

No. 4.—Investigations of *Hylotrupes bajulus* L.—I, The Influence of Temperature and Humidity on the Egg Stage and Observations on the Biology of the Adult Beetle, by P. Steiner (pp. 531–546); Contributions to the Physiology of Nutrition of the Larva of *Hylotrupes bajulus* L., by K. Schuch (pp. 547–558); Investigations of the Vitality of the Two Strains of *Habrobracon juglandis* Ashm. Under Different Conditions, by E. Hoppe (pp. 559–577); Determination of the Species and Role of Insect Pollinators of Cotton in Central Asia, by V. V. Jachontov (V. V. Yakhontov) (pp. 578–595); The Influence of Climatic Conditions on the Size of *Pieris brassicae* L. (Lep.), by H. Auel (pp. 596–602); The Hip (Rose Fruit) Fruitfly *Rhagoletis alternata* Fall., by F. Klein-Krautheim (pp. 603–614); and Experiments on the Action of Contact Dust Insecticides on *Pieris brassicae* L., With Particular Reference to Its Dependence on Biotic and Abiotic Factors, by W. Thalenhorst (pp. 615–652).

[Work in entomology by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 143–171, 261, 262, figs. 3*).—The activities of the year (E. S. R., 77, p. 359), by W. P. Flint, G. H. Dungan, J. H. Bigger, M. D. Farrar, L. H. Shropshire, S. C. Chandler, J. R. Holbert, O. T. Bonnett, R. H. Painter (Kansas Station), R. H. Reed, C. C. Compton, C. W. Kearns, W. E. McCauley, E. R. McGovran, A. S. Colby, and R. S. Marsh, dealt with include paper barriers for control of chinch bugs, and the preference of chinch bugs for different small grains, the importance of knowledge gained from hibernation studies in checking insect loss, resistance of certain corn varieties and hybrids to the southern corn rootworm, prevention of white grub damage by suitable crop adjustments resulting from periodic surveys, reduction of root aphids on corn grown on sweetclover stubble, corn earworm studies, value of new insecticides in the prevention of damage to stored grain, tests of fumigants for control of stored grain pests, prevention of injury to stored corn through application of a 10-percent oil emulsion, work with wheat varieties resistant to the hessian fly, destruction of a high percentage of peach borers with liquid paradichlorobenzene, control work with

the plum curculio, the importance of the oriental fruit moth, insect parasites, oil dusts for control of the oriental fruit moth, a study of the cat-faced peach problem, a study of soybean products in codling moth control, value of a San Jose scale survey, progress in round-headed apple tree borer control, production cost of oil spray application for use in the injector attachment, reduction in insect pests resulting from renovation of strawberry beds, tests of summer oils in the prevention of raspberry loss, failure of new copper sprays to match bordeaux on potatoes in control of the potato leafhopper, bean leafhopper control, saving resulting from insect outbreak forecast, protection of greenhouse cucumbers against thrips by application of insecticides, control of the cyclamen mite on begonias by the use of naphthalene and a proprietary mixture, value of mixture containing aliphatic thiocyanates in greenhouse scale control, red spider studies, control of leaf tiers (the greenhouse leaf tier and the oblique-banded leaf roller) by the use of a pyrethrum-selenium combination spray, protection of elms from the European elm scale by the application of a 5-percent dormant oil emulsion, protection of newly set shade trees from borers by wrapping the trunks, flea control by naphthalene flakes, locust borer control, turf protection from insect damage, and control of the grape leafhopper.

[**Work in entomology by the Missouri Station**] (*Missouri Sta. Bul. 387 (1937), pp. 58–61, 74, 75, 110*).—Reference is made to the occurrence of and control work of the year (E. S. R., 76, p. 655) relating to the hessian fly, chinch bug, squash bug, and the spotted and striped cucumber beetles, all by L. Haseman; the codling moth, including biological studies, timing sprays by moth emergence, spraying investigations, spray residues, the effect of weather and parasites, moths from packing sheds, and baiting moths, by Haseman, K. L. Parman, H. L. Koch, C. H. Baldwin, and L. Jenkins. substitutes for lead arsenate in sprays, by C. G. Vinson, and zinc arsenate as a substitute for lead arsenate, by H. G. Swartwout; and emergency grasshopper control, by Haseman.

[**Work in entomology by the North Carolina Station**] (*North Carolina Sta. Rpt. 1934, pp. 43, 44, 52, 66, 67, 78–81*).—The work of the year in entomology considered (E. S. R., 74, p. 67) relates to stored corn insects (the rice weevil and the Angoumois grain moth) and the fall armyworm on corn, both by B. B. Fulton; the potato leafhopper on peanuts; the corn earworm (E. S. R., 75, p. 512); the biology of the Homoptera, by Z. P. Metcalf; the wintering of bees; a survey of the honey-producing plants of the State, by F. B. Meacham; the bees of North Carolina; the taxonomy and biology of the leaf-cutter bees (*Megachile*), by T. B. Mitchell (E. S. R., 77, p. 670); and the genetics of *Habrobracon juglandis*, by C. H. Bostian.

[**Contributions on the codling moth and other fruit insects**] (*Tenn. State Hort. Soc. Proc., 32 (1937), pp. 11–19, 27–46, figs. 3*).—These contributions presented at the 1937 convention of the Tennessee State Horticultural Society include the following: Progress in Peach Borer Control, by O. I. Snapp (pp. 11–19); Improving Codling Moth Control, by L. F. Steiner (pp. 27–40); Injector Simplifies Method of Making Oil Emulsions, by W. W. Stanley (pp. 40–42) (Tenn. Experiment Station); One Year's Results With Codling Moth Bait Pans, by I. C. Murphy (pp. 42–44); Experience with Codling Moth, by E. B. Bonham (pp. 44, 45); and The *Prionus laticollis*, by D. E. Hedges (pp. 45, 46).

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc., No. 33 (1937), pp. 48, figs. 3*).—The contributions here presented (E. S. R., 76, p. 650) include the following: The Juniper Webworm (*Dichomeris marginella* Fabr.), by H. Andison (pp. 3–5); An Orthopterous Pest [*Cyphoderris monstrosa* Uhler] of Apple Trees in the Interior of B. C., by A. A.

Dennys (pp. 6, 7); The Introduction and Propagation of *Digonichaeta setipennis* Fall., a Parasite of the European Earwig, by C. W. Getzendaner (pp. 8–12); The Status of the Gladiolus Thrips in British Columbia, by R. Glendenning (pp. 13, 14); Studies on the Rate of Tick Feeding in Relation to Disease, by J. D. Gregson (pp. 15–21); The Crumena of the Coccidae and the *Adelges*, by A. D. Heriot (pp. 22–24); A Preliminary List of Protozoa in British Columbia Termites, by J. K. Jacob (pp. 25–29); Winter Insects in British Columbia—Diptera: *Cramptonomyia spenceri* Alexander, by J. K. Jacob (pp. 30, 31); Some Food Plants of Lepidopterous Larvae—List 4, by J. R. J. Llewellyn-Jones (pp. 32–34); A Review of Tick Paralysis in Cattle in British Columbia, With Notes on Several New Cases, by T. K. Moilliet (pp. 35–39); The Life History and Habits of the Red-Legged Ham Beetle "*Necrobia rufipes*" (De Geer), by H. F. Olds (pp. 40, 41); The Termite Situation in British Columbia in 1936 (pp. 42, 43) and The Menace of Rat Parasites in Vancouver in 1936 (pp. 44, 45), both by G. J. Spencer; and Insects (or Near Relatives) of Economic Importance Recently Noted in British Columbia (pp. 46, 47).

Insect notes from Costa Rica in 1934 [and 1935], C. H. Ballou (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Insect Pest Survey Bul., 15 [1935], No. 4, Sup., pp. 163–212, pl. 1; 16 (1936), No. 9, Sup., pp. 437–497*).—Tables prepared from monthly notes on the occurrence of the insects of Costa Rica, arranged systematically by orders and families with their localities and host plants, are presented.

Entomology, C. H. Ballou (*Cent. Nac. Agr. [Costa Rica] Bol. 18 (1936), pp. 95–142*).—This report of the chief of the section of entomology of the National Department of Agriculture of Costa Rica consists in large part of a host list of the insects observed in 1934, of which a tabular list is noted above.

Study and control of insect pests (*[China] Natl. Agr. Res. Bur. Misc. Pub. 5 (1936), pp. 27–33*).—The rice borer, epidemiological experiments with the paddy borer *Schoenobius bipunctifer*, the Asiatic rice borer, the purplish-stem borer *Sesamia inferens*, the Chinese rice grasshopper *Oxya chinensis* Thunb., the bamboo locust *Ceracris kiangsu* Tsai, and the rice weevil (E. S. R., 75, p. 385), and other projects are reported upon. A spring survey is said to have shown that the Asiatic rice borer was rather widely distributed, while *S. bipunctifer* was abundant only in the southern part of China and along the sea coast.

The insect and allied fauna of cultivated mushrooms, III, M. D. Austin (*Ent. Mo. Mag., 3. ser., 23 (1937), No. 267, pp. 66, 67*).—A continuation of the contribution previously noted (E. S. R., 70, p. 61).

[Contributions on shade tree insects and their control] (*Natl. Shade Tree Conf. Proc., 12 (1936), pp. 4–7, 14–28, 145–177, fig. 1*).—Contributions relating to economic insects, presented at the National Shade Tree Conference held in Boston, Mass., in September 1936, included the following: Forest Insects in New England, by H. B. Peirson (pp. 4–7); Summary of the Dutch Elm Disease Eradication Project, by W. H. Rankin (pp. 14–20); Pathological Studies on Beech at the Arnold Aboretum [Beech Scale and Two-Lined Chestnut Borer], by J. H. Faull (pp. 21–28); The European Spruce Sawfly [*Diprion polytomum* Htg.], by H. J. MacAloney (pp. 145–150); The Identification of Insect Injury, by C. C. Hamilton (pp. 150–160), contributed from the New Jersey Experiment Stations; Possibilities of Dusting Shade Trees for Pest Control, by G. K. Van Gundia (pp. 161–165); and Distribution of Arsenicals from the Air, by E. H. Francis (pp. 168–177).

Mermis subnigrescens, a nematode parasite of grasshoppers, J. R. Christie (*Jour. Agr. Res. [U. S.], 55 (1937), No. 5, pp. 353–364, figs. 6*).—In reporting upon the biology of *M. subnigrescens* Cobb 1926, the author points out that

both it and *Agamermis decaudata* Cobb, Steiner, and Christie 1923 (E. S. R., 75, p. 234) are important vectors in grasshopper control throughout the regions in which they occur, *M. subnigrescens* being perhaps the most important This species has been found to be a common parasite of grasshoppers occurring throughout the northeastern part of the United States and westward as far as Minnesota, Iowa, and Missouri. The studies here reported are based upon work in New England, where this nematode is widely distributed.

During a survey of the Merrimack and Connecticut River Valleys in 1930, 2,500 grasshoppers were examined, of which 12 percent were found infested with mermithids, largely *M. subnigrescens*. The adults of this parasite occur in the soil. On rainy days during June and July gravid females come to the surface of the ground, ascend low herbaceous vegetation, and deposit their eggs. The eggs adhere to the foliage by means of the entangling appendages or byssi. Grasshoppers, while feeding, swallow the eggs, which hatch in the alimentary tract. The larvae immediately migrate through the wall of the alimentary tract into the body cavity. They remain in the host from 4 to 10 weeks to complete their growth; then they emerge by forcing their way through the body wall and enter the soil. They molt the following April and pass the ensuing summer and winter in the soil, and the females deposit their eggs the next summer.

A general investigation of the locust outbreaks in China during the year 1935, F. C. Woo and T. S. Cheng (*[China] Natl. Agr. Res. Bur. Spec. Pub. 14 (1936), pp. 20, pl. 1, figs. 2; Eng. abs., pp. 19, 20*).—This investigation relates to two species of swarming locusts observed in China during 1935, the migratory locust *Locusta migratoria* L. and the bamboo locust *Ceracris kiangsu* Tsai.

The bean thrips, S. F. Bailey (*California Sta. Bul. 609 (1937), pp. 36, figs. 10*).—This summary of knowledge of the bean thrips includes a review of the literature with a list of 38 references, that contained in the author's earlier report (E. S. R., 69, p. 826), more recent observations, and control measures. The author has been unable to detect the high parasitism by the internal parasite *Thripoctenus russelli* reported by Russell in 1912 (E. S. R., 28, p. 250), it having been about 5 percent during the seasons of 1929–31.

Control experiments on beans conducted in July and August 1936 with some of the newer dust mixtures, including nicotine, pyrethrum, rotenone, cryolite, barium fluosilicate, and cube, are summarized in tables. In the field with pink beans at Patterson in July the mixture of pyrethrum and sulfur and of cube and sulfur gave the best control. In control experiments with baby lima beans near Davis in August the pyrethrum mixture again gave the best control, but for 48 hr. only. Experiments conducted at the same time in the Sutter Basin field, where a much higher population of thrips was available for treatment, the pyrethrum mixture again most effectively reduced the larval population.

It is pointed out that elimination of the weed source of infestation is the most important step in bean thrips control. Overhead irrigation with the so-called rain machines has under certain conditions held the bean thrips in check.

The biology of Thysanoptera with reference to the cotton plant.—VIII, The relation between variations in temperature and the life cycle, E. I. MacGill (*Ann. Appl. Biol., 24 (1937), No. 1, pp. 95–109, figs. 8*).—This contribution is in continuation of those previously noted (E. S. R., 66, p. 554).

The biology of Leptobyrsa rhododendri Horvath (Hemiptera, Tingitidae), the rhododendron lacebug.—II, Feeding habits and the histology of the feeding lesions produced in rhododendron leaves, C. G. Johnson (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 342–355, pls. 3*).—In this further contribu-

tion (E. S. R., 76, p. 362) brief mention is made of the plants attacked by the rhododendron lacebug and of the problem of immunity and susceptibility of rhododendrons to attack by the bug. Its host plants, feeding methods and regions of plant attacked, and feeding lesions are considered. A list of 24 references to the literature is included.

How to fight the chinch bug, C. M. Packard and C. Benton (*U. S. Dept. Agr., Farmers' Bul. 1780 (1937), pp. II+22, figs. 11*).—This supersedes Farmers' Bulletin 1498, previously noted (E. S. R., 55, p. 458).

A revision of the leafhoppers of the Macrosteles group (Cicadula of authors) in America north of Mexico, H. E. Dorst (*U. S. Dept. Agr., Misc. Pub. 271 (1937), pp. 24, figs. 6*).—In the present revision the genus *Cicadula* is placed in the synonymy under *Thamnotettix*, and the species therein contained are now placed in the genus *Macrosteles*, which has been resurrected, and in the two new genera *Davisonia* and *Sonronius*. Five species are recognized as belonging to the new genus *Davisonia*, of which 1 is described as new; 3 to the new genus *Sonronius*; and 16 to the genus *Macrosteles*, of which 1 is described as new. At least 1 species is known to be of economic importance, namely, *M. divisus* (Uhler) (officially known as the six-spotted leafhopper), which is capable of transmitting the yellows virus disease to celery, lettuce, carrot, parsley, and aster. This species is also of importance in the eastern part of the United States as a feeder on oats, corn, timothy, potato, and pasture grass.

A list is given of 27 references to the literature cited.

A new virus of maize transmitted by Cicadulina spp., H. H. Storey (*Ann. Appl. Biol., 24 (1937), No. 1, pp. 87–94, pl. 1*).—An account is given of the transmission in East Africa of an apparently new virus disease of corn, referred to as the "mottle" virus disease, by active races of the same species of *Cicadulina* that transmit the streak virus.

Trap-light studies on leafhoppers belonging to the genus Empoasca (Homoptera: Cicadellidae), with the description of two new species, N. H. Wheeler (*Ent. Soc. Wash. Proc., 39 (1937), No. 6, pp. 141–156, figs. 4*).—The results of trap-lights operated over the 4-yr. period 1932–35 at the Arlington (Va.) Experiment Farm for the purpose of collecting species of *Empoasca* are reported. The first and last seasonal appearances, relative abundance, and proportion of sexes are reported. Notes are given on five new species, with descriptions of two, and some new synonymy are included. The data obtained on the seasonal occurrence of the potato leafhopper, an insect of much economic importance, are emphasized.

A bacterial disease of Aphis rumicis Linn., apparently caused by Bacillus lathyri Manns and Taubenhaus, N. V. Needham (*Ann. Appl. Biol., 24 (1937), No. 1, pp. 144–147*).—An organism culturally resembling *B. lathyri* was isolated from aphids (the bean aphid) which showed evidence of disease, in that they died within 24 hr. of removal from the host plant. Bacteriological examination of healthy aphids indicated that they are remarkably free from bacteria, few colonies being found in cultures, even when made from the crushed insects.

The problems raised by the woolly aphis of the apple: A case for team research (*Ann. Appl. Biol., 24 (1937), No. 1, pp. 169–210, pls. 5, figs. 6*).—A symposium on the woolly apple aphid, contributed by members of the staffs of the East Malling Research Station and the John Innes Horticultural Institution, which includes the following: Introduction (pp. 169–173) and The Northern Spy as a Rootstock (pp. 173–180), both by R. G. Hatton; The Root System of Northern Spy, by W. S. Rogers (pp. 180–184); The Control of Woolly Aphis, by R. M. Greenslade (pp. 184–187); Breeding Immune Rootstocks, by M. B. Crane (pp. 188–195); Entomological Technique, by A. M. Massee (pp. 195–198);

Pomological Selection of the New Rootstocks, by H. M. Tydeman (pp. 199–205); and Studies on Possible Causes of Immunity, by W. A. Roach (pp. 206–210).

A new root aphid (Homoptera: Aphidae), P. W. MASON (*Ent. Soc. Wash. Proc., 39 (1937), No. 6, pp. 166, 167, fig. 1*).—An aphid collected on the roots of cotton at Florence, S. C., and which also attacks the roots of okra, butter beans, wheat, oats, barley, celery, iris, and several other plants in Maryland, Virginia, North Carolina, South Carolina, Alabama, Ohio, Indiana, Illinois, Missouri, Texas, and California, is described as new under the name *Rhopalosiphum subterraneum*.

Asiphonaphis and Aphis studies (Homoptera: Aphididae), G. F. KNOWLTON (*Ent. News, 48 (1937), No. 6, pp. 170–172, fig. 1*).—*Asiphonaphis utahensis*, collected from *Salsola pestifer* at Thompsons, Utah, and *A. carolinensis*, collected from an unknown host at Florence, S. C., are described as new, and notes on a collection of 23 additional forms from Idaho and elsewhere are given in this contribution from the Utah Experiment Station.

The bionomics and ecology of red scale (Aonidiella aurantii Mask.) in Southern Rhodesia, E. PARRY JONES (*Brit. So. Africa Co. Pub. 5 (1937), pp. 11–52, pl. 1, figs. 7*).—A report of studies of the biology of the California red scale, including the correlation of temperature with development, and its control in the citrus area of Southern Rhodesia.

A population study of Cacoecia cerasivorana Fitch, with special reference to its insect parasites (Tortricidae—Lepidoptera), C. H. HOFFMAN (*Bul. Brooklyn Ent. Soc., 31 (1936), No. 5, pp. 209–211*).—A population study of nests of the ugly-nest caterpillar, collected near St. Paul, Minn., particularly as relates to its dipterous and hymenopterous parasites, is reported. This caterpillar, which feeds principally upon the chokecherry, also attacks wild cherry, apple, raspberry, garden cherry, and birch.

The pink bollworm of cotton in Puerto Rico during 1936 and recommendations for its control, L. C. FIFE (*Puerto Rico Sta. Agr. Notes No. 81 (1937), pp. 9*).—A general account is given of the life history and habits of the pink bollworm and its status in Puerto Rico in 1936, together with methods applicable in reducing its damage. It is pointed out that okra is a favorable alternate host plant of this pest, and that the growth of this vegetable during the dead season of cotton production is undesirable. Maga (*Montezuma speciosissima*) and emajag illa (*Thespesia populnea*) are important host plants of the pink bollworm and also of the cotton stainers, and the destruction of these trees in cotton-growing areas is advisable. Companion cropping should be avoided.

Report on status of the European corn borer in 1935 [and 1936], A. M. VANCE (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Insect Pest Survey Bul., 15 (1935), No. 9, Sup., pp. 423–431, pls. 2; 16 (1936), No. 9, Sup., pp. 429–436, pls. 3*).—Data are tabulated for the 2 yr.

Colonization of foreign parasites of the European corn borer in the United States for 1935 [and 1936], W. G. BRADLEY and E. W. BECK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Insect Pest Survey Bul., 15 (1935), No. 9, Sup., pp. 433–441, pls. 13; 16 (1936), No. 9, Sup., pp. 499–505, pl. 1*).—Data are tabulated for the 2 yr.

The use of shade cloth to exclude the raisin moth from drying fruits, H. C. DONOHOE, D. F. BARNES, C. K. FISHER, and P. SIMMONS (*Calif. Dept. Agr. Bul., 26 (1937), No. 2, pp. 204–206, fig. 1*).—Directions are given for the use of a shade cloth in protecting drying and dried fruits on the ranches.

California microlepidoptera, XI, H. H. KEIFER (*Calif. Dept. Agr. Bul., 26 (1937), No. 2, pp. 177–203, pls. 7*).—This further contribution (E. S. R., 76, p. 662)

presents the chronology of the tomato pinworm, followed by annotated descriptions of five species of *Gnorimoschema*, of which one, *G. altisolani*, taken by the author on *Solanum xantii* in Alpine County, Calif., is described as new. Keys to the adults and larvae of species of this genus feeding on *Solanum* and *Chenopodium* in California and descriptions of "*Gelechia*" *salicophaga* n. sp., collected by the author on *Salix sessilifolia* at Sacramento, *Scythris altisierrae* n. sp., taken by the author from *Solanum xantii* in Alpine County, and *Lineodes integra* Zell. are included in the contribution.

Lepidopterous pests of the sour-sop in Trinidad, I, II, R. G. FENNAH (*Trop. Agr.* [*Trinidad*], *14* (*1937*), *Nos. 6, pp. 175–178, pls. 4; 8, pp. 244, 245, pls. 2*).—*Cerconota* (*Stenoma*) *anonella* Sepp. is dealt with in part 1 as one of the three principal insects that attack the developing fruit of the soursop (custard apple), a common garden plant in Trinidad, and are held responsible for reducing its appearance in the local market to a negligible quantity. *Thecla ortygnus* Cram., the intensity of the attack of which on soursop varies greatly from tree to tree, is considered in part 2.

Investigations of the frit fly (Oscinella frit L.) and its occurrence in Switzerland [trans. title], K. Roos (*Landw. Jahrb. Schweiz*, *51* (*1937*), *No. 6, pp. 585–666, figs. 49*).—This contribution on the anatomy, biology, occurrence, and control of the frit fly is presented with a list of 56 references.

Parasites of Epicypta testata Edw. (Mycetophilidae), K. G. BLAIR (*Ent. Mo. Mag.*, *3. ser.*, *23* (*1937*), *No. 265, p. 19*).—Two hymenopterous parasites, the belytid *Xenotoma* (*Zelotypa*) *fallax* Kieff. and an ichneumonid of the genus *Aperileptus*, are recorded as having been reared from the mycetophilid fly *E. testata* in England.

Hessian fly infestation at harvest time, 1935 [and 1936], C. M. PACKARD (*U. S. Dept. Agr., Bur. Ent. and Plant Quart., Insect Pest Survey Bul.*, *15* [*1935*], *No. 6, Sup., pp. 323, 324, pl. 1; 16* (*1936*), *No. 6, Sup., pp. 309–311, pl. 1*).—Data are tabulated for the 2 yr.

Investigations on the control of leather jackets, B. LOVIBOND (*Jour. Bd. Greenkeeping Res.* [*England*], *5* (*1937*), *No. 16, pp. 12–17, figs. 3*).—Notes on crane flies and their larvae (leatherjackets), with a brief reference to the economic species, including three of *Pales* and five of *Tipula*; on the use of the light trap, which demonstrated the futility of its use against *T. paludosa* Meig.; and on the efficiency of the St. Ives liquid exterminator when applied to the ground are presented.

Methods of investigating the bionomics of the common crane-fly Tipula paludosa Meigen, together with some results, H. F. BARNES (*Ann. Appl. Biol.*, *24* (*1937*), *No. 2, pp. 356–368, pl. 1*).—A study of the biology of *T. paludosa*, the full-grown larvae of which were obtained by application of an emulsion of orthodichlorobenzene to the soil, is reported upon.

The North and Central American spider parasites of the genus Pseudogaurax (Diptera: Chloropidae), D. G. HALL (*Jour. Wash. Acad. Sci.*, *27* (*1937*), *No. 6, pp. 255–261, figs. 7*).—A key to and descriptions of the species of *Pseudogaurax*, parasites of spiders, in North and Central America, four being described as new.

Parasitization of the Mediterranean fruitfly in Hawaii, 1914–33, H. F. WILLARD and A. C. MASON (*U. S. Dept. Agr. Circ. 439* (*1937*), *pp. 18, figs. 3*).—This is a summary of the situation in Hawaii as relates to parasitization of the Mediterranean fruitfly, including work previously noted (E. S. R., 63, p. 53) and that conducted since the earlier report. This pest, which was discovered in Hawaii in 1910, encountered few natural enemies in its new environment until 1913 and 1914, when introductions of four larval parasites, namely, *Opius*

humilis Silv., *O.* (*Diachasma*) *tryoni* Cam., *O.* (*Diachasma*) *fullawayi* Silv., and *Tetrastichus giffardianus* Silv., became established. Records of parasitization by these species are presented, the details being given in tables and charts.

"Parasitization of larvae in some of the more favorable host fruits is shown to be high, often ranging between 95 and 100 percent in certain samples; but parasitization of larvae from all host fruits collected over yearly periods after 1914 ranged from 24.9 to 55.8 percent, with an average of 42.3 percent for the entire period. After liberation in Hawaii, O. *humilis* became established and effective more rapidly than either of the other two species of *Opius* and became abundant 2 or 3 yr. sooner; but was soon superseded in effectiveness by *O. tryoni*. Parasitization records, showing the efficiency of each species of parasite over monthly and yearly periods, indicate clearly the controlling influence of O. *tryoni* over O. *humilis*.

"The texture of the skin and the thickness of the pulp of the various host fruits seems to be a governing factor in the degree of parasitization by *Opius* by rendering fruitfly larvae less accessible to the parasites in certain fruits.

"The high degree of multiple parasitization of larvae in coffee cherries (coffee berries) in the Kona district on the island of Hawaii has eliminated *O. humilis* as a control factor of the Mediterranean fruitfly in that district, its place being taken by the other two species of *Opius*. This is the only section in Hawaii where the Mediterranean fruitfly can be considered under control as a result of introduced parasites. This control is due to the very high degree of parasitization of the fly in coffee cherries.

"Of the four species of introduced parasites, *O. tryoni* was the most valuable in controlling this fruitfly under Hawaiian conditions. O. *fullawayi* has ceased to parasitize larvae in nearly all fruits except coffee cherries. Data showing the average infestation per fruit over yearly periods, 1916–33, show a marked decrease in infestation during the last 10 or 11 yr. of that period. This decrease on the island of Oahu, although due largely to parasitic control, was to some extent, at least, caused by other environmental factors affecting the fly."

Investigations on the utilization of cold in control of the cherry fruitworm Rhagoletis cerasi L. [trans. title], A. Balachowsky (*Ann. Épiphyt. et. Phytogénét., n. ser., 3 (1937), No. 1, pp. 137–140*).—The author has found that in order to obtain a total mortality of *R. cerasi* through refrigeration of cherries containing second and third stage (or most resistant) larvae it is necessary to hold the fruit at a constant temperature of −4.5° C. for at least 3 days, and that the fruit is injured by the cold. In a humid atmosphere a temperature of 44° was found to destroy the larvae of *R. cerasi* after 12 hr., but the cherry fruit is too delicate to support so high a temperature without injury.

The biology of Sarcophaga cistudinis Aldrich (Diptera), a species of Sarcophagidae parasitic on turtles and tortoises, E. F. Knipling (*Ent. Soc. Wash. Proc., 39 (1937), No. 5, pp. 91–101, figs. 9*).—Data are given on the life history of the sarcophagid *S. cistudinis* in the gopher tortoise (*Gopherus polyphemus*), together with a description of its immature larval stages.

Rational control of stableflies [trans. title], G. Notini (*K. Landtbr. Akad. Handl. och Tidskr., 75 (1936), No. 7, pp. 727–771, figs. 7*).—This contribution is accompanied by a seven-page list of references to the literature.

A new species of Thrassis (Siphonaptera), W. L. Jellison (*Pub. Health Rpts. [U. S.], 52 (1937), No. 23, pp. 726–729, figs. 6*).—*T. pandorae*, taken from ground squirrels in Montana, Wyoming, and Oregon, during the course of studies of sylvatic plague, is described as new. This species was found to be the most abundant of the four species of fleas commonly found on Wyoming ground

squirrels in the epizootic area. It was also collected in epizootic areas in Oregon. It is considered of interest as a possible vector of *Bacillus pestis*.

The louse fly Lynchia fusca, parasite of the owl (Bubo virginianus pacificus), a new vector of malaria of the California Valley quail, W. B. HERMS and C. G. KADNER (*Jour. Parasitol., 23 (1937), No. 3, pp. 296, 297*).—The authors report (E. S. R., 77, p. 245) having found the louse fly *L. fusca* to be a vector of the malaria parasite of California Valley quail, discovered by O'Roke in 1927 (E. S. R., 60, p. 276) and described in 1929 as *Haemoproteus lophortyx*.[3] It was found by O'Roke in 1930[4] to be transmitted by *L. hirsuta* Ferris.

The biology and hibernation of some Timarchas (Coleoptera: Chrysomelidae) [trans. title], M. ABELOOS (*Compt. Rend. Soc. Biol.* [*Paris*], *124 (1937), No. 6, pp. 511–513*).—This contribution reports upon two species of *Timarcha* (*T. tenebricosa* Fab. and *T. violacco-nigra* DeG.) common in the west of France.

Researches on the Colorado potato beetle.—III, Causes of natural reduction: Environment, food, enemies, and diseases [trans. title], J. FEYTAUD (*Ann. Épiphyt. et Phytogénét., n. ser., 3 (1937), No. 1, pp. 35–97, figs. 9*).—This further contribution (E. S. R., 68, p. 792) deals with the influence of environment, food, and parasites and predators upon the Colorado potato beetle in France.

The genus Scolytus in Great Britain, with notes on the structure of S. destructor Ol., R. C. FISHER (*Ann. Appl. Biol., 24 (1937), No. 1, pp. 110–130, figs. 14*).—Information obtained on the systematic and morphological aspects, while engaged in the study of the biology, of the large elm bark beetle *S. destructor* in Great Britain during a period of 3 yr. is reported. A key to species of *Scolytus* in Great Britain—six in number, with notes on their habitats, is appended.

Experiments on control of peach curculio, G. C. STARCHER (*Tenn. State Hort. Soc. Proc., 31 (1935), pp. 55, 56*).—Referring briefly to control of the peach curculio, based upon experiments at Thomaston, Ga., it is stated that Dutox offers a safe means through spraying in the fall and not delaying until spring.

On the activity of oviposition of the strawberry weevil Anthonomus bisignatus Roelofs, M. KATÔ (*Tôhoku Imp. Univ., Sci. Rpts., 4. ser., 10 (1936), No. 4, pp. 697–708, figs. 7*).—Observations in Sendai of the oviposition and economic importance of *A. bisignatus*, together with the correlation of oviposition activity and the climate, are reported. Its injury to the flower buds was observed to be uniform in each row of the experimental field and the rate of injury almost constant for each strawberry plant. The climatic condition is said to correlate fairly well with the daily fluctuation of the number of eggs laid.

A statistical investigation of the correlation between climatic conditions and the egg-laying activity of the strawberry weevil Anthonomus bisignifer Schenkling, M. KATÔ (*Tôhoku Imp. Univ., Sci. Rpts., 4. ser., 11 (1937), No. 3, pp. 307–321, figs. 6*).—This further contribution deals with the results obtained by a statistical investigation based on the correlation between the climate and the diurnal activity of oviposition in the case of this strawberry weevil. Six climatic factors controlling the activity of the egg laying were studied, namely, the total radiant energy, the soil surface temperature, the air temperature measured at the height of 30 cc above the soil surface, the evaporation, the humidity, and the rainfall.

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[3] Science, 70 (1929), No. 1818, p. 432.
[4] Calif. Univ. Pubs. Zool., 36 (1930), No. 1, pp. 50, pls. 2, figs. 6.

Of these six factors "it may be conclusively recognized that the total radiant energy and the soil surface temperature are most noticeable, the former being most effective in the period extending from the sixth to the fourteenth and the latter being most prominent in the period extending from the tenth hour to eighteenth. The rainfall inhibits almost all of the egg-laying activity of this weevil."

The influence of size of brood cell upon the size and variability of the honeybee (Apis mellifera L.), R. A. Grout (*Iowa Sta. Res. Bul. 218 (1937), pp. 257–280, figs. 3*).—Following a brief review of the literature, 39 references to which are presented, experimental work conducted is reported upon, the details being given in tables and charts. It is shown that enlarged brood cells affect the size of the adult worker bee, and that significantly larger worker bees are obtained through the use of enlarged cell foundation. "The average percentage increases of the linear measnrements of the adult worker bees are almost proportional to the percentage increases of the diameters of the brood cells. The increase in the size of the bee does not qnite keep pace with increases in cell size. Size of brood cell apparently does not affect the variability of the adult worker bee, except possibly its dry weight. The number of bees used in a sample in this experiment is not great enough to give wholly consistent results, but these results in general are significant and indicative. Dry weight is difficult to measure, and further experimental control is needed. Among body measurements, exclusive of proboscis, length of right forewing gives the best estimate of length of proboscis. Of the two major parts of the proboscis, the mentum (which is the more easily measured) is more highly correlated with proboscis length than is the glossa. A combination of length of right forewing and mentum length affords an excellent estimate of proboscis length."

The cause and control of swarming in bees, E. J. Russell et al. (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 20 [1935], pp. 31, figs. 3*).—Contributions presented at another conference (E. S. R., 72, p. 819), held at Rothamsted on April 27, 1935, are as follows: Historical Notes on Theories of Swarm Control, by A. D. Betts (pp. 6–9); Gerstung's Brood Food Theory, by Brother Adam (pp. 10–13); Swarming and the Division of Labour in the Hive, by D. Morland (pp. 14–17); The Snelgrove Method of Swarm Prevention, by L. E. Snelgrove (pp. 18–21); The Demaree Plan (pp. 22, 23), based on a lecture by W. H. J. Prior; The Peck System, by C. F. Clay (pp. 24–26); and Swarming: What Is the Cause? by W. Hamilton (pp. 27–31).

One-year studies on the biology of the honey-bee in Palestine, F. S. Bodenheimer and A. Ben-Nerya (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 385–403, figs. 6*).—A preliminary study of the biology of the honeybee in the hills of Palestine, conducted from April 1935 to May 1936, is reported upon.

An annotated list of the ants of Arizona (Hymen.: Formicidae), A. C. Cole, Jr. (*Ent. News, 48 (1937), Nos. 4, pp. 97–101; 5, pp. 134–140*).—An annotated list is given of 152 forms of ants found in Arizona.

Brood diseases of bees in California, their symptoms, methods of diagnosis, and treatment, H. M. Krebs (*Calif. Dept. Agr. Bul., 26 (1937), No. 2, pp. 234–246, fig. 1*).—American and European foulbrood are considered.

Studies on American foul brood of bees.—I, The relative pathogenicity of vegetative cells and endospores of Bacillus larvae for the brood of the bee, H. L. A. Tarr (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 377–384*).—In work at the Rothamsted Experimental Station vegetative cells of *B. larvae* did not produce "American foulbrood in healthy nuclei even when a dose almost 3,000 times

greater than an inoculum of spores of this organism capable of causing the disease has been sprayed over the developing brood. A very much smaller inoculum of the spores of *B. larvae* is effective in producing American foulbrood when the developing larvae of healthy nuclei are sprayed directly with them than when they are fed in sirup to the bees."

Addled brood of bees, H. L. A. Tarr (*Ann. Appl. Biol., 24 (1937), No. 2, pp. 369–376, pls. 2*).—In studies conducted at the Rothamsted Experimental Station addled brood was found to be produced by defective queen bees and is not of a contagious nature as are the other common brood diseases.

Bee poisoning through the use of an arsenical orchard spray, E. Braun (*Amer. Bee Jour., 77 (1937), No. 4, pp. 175, 176*).—Comparisons made of colonies subjected to orchard spray and those removed during the spraying period at the Dominion Experimental Farm, Manitoba, are reported upon in table form.

Ants and their control in California, J. E. Eckert and A. Mallis (*California Sta. Circ. 342 (1937), pp. 37, figs. 26*).—This practical account supersedes Circular 38 (E. S. R., 20, p. 352) and Bulletin 207 (E. S. R., 24, p. 167), but covers the general subject of ants in California and their control.

Experimental studies in insect parasitism.—V, The sense used by Trichogramma to distinguish between parasitized and unparasitized hosts, G. Salt (*Roy. Soc. [London] Proc., Ser. B, 122 (1937), No. 826, pp. 57–75*).—The studies reported (E. S. R., 76, p. 833) deal with the sense used by ovipositing females of *T. evanescens* in distinguishing healthy hosts from those already parasitized. "Sight, hearing, and touch are eliminated, and the chemical sense is indicated as the one used. The parasite is able to distinguish between clean hosts and hosts that have been merely walked upon (not stung or oviposited in) by another female of its species. If hosts that have been walked upon are washed in water, the parasite can no longer distinguish them. The means of discrimination is of a chemical nature and, being volatile, can be considered an odor."

A new ichneumonid, Scopimenus pygobarbus, parasitic on Nematus proximus Lep. (Hym., Tenthredinidae) in Britain, M. Carleton (*Ent. Mo. Mag., 3. ser., 23 (1937), No. 267, pp. 61–65, fig. 1*).—A brief account of the rearing, by the author, of the ichneumonid parasite *S. pygobarbus* from *N. proximus*, the bean gall sawfly of willows, is followed by a description of the adult (*S. pygobarbus* n. g. and sp.) by A. Roman, two specimens of this parasite having been reared from *N. proximus*.

A new West Indian species of Mirax Haliday parasitic on the coffee leaf-miner (Hymenoptera: Braconidae), C. F. W. Muesebeck (*Ent. Soc. Wash. Proc., 39 (1937), No. 6, pp. 139–141, fig. 1*).—A new species of the microgasterine genus *Mirax* (*M. insularis*), a synopsis of which genus has been published by the author (E. S. R., 48, p. 59), all the known species of which are parasites of lepidopterous leaf miners or bast miners, is described. This new species was reared by the Puerto Rico College Experiment Station from the coffee leaf miner *Leucoptera coffeella* Guér. on the islands of Guadeloupe and Dominica.

Additional experiments for the control of fruit-tree red mite (Paratetranychus pilosus C. & F.), J. and E. M. Listo (*[Finland] Valtion Maatalouskoet. Julkaisu. (Agr. Expt. Activ. State Pub.), No. 91 (1937), pp. 12; Eng. abs., pp. 11, 12*).—The results of spraying experiments for control of the European red mite during the years 1933–34, in continuation of those previously noted (E. S. R., 73, p. 518), are reported upon.

A contribution to the study of the evolution of the ornithodores: Biology and longevity of Ornithodoros megnini [trans. title], E. Brumpt

(*Ann. Parasitol. Humaine et Compar.*, *14* (*1936*), *No. 6, pp. 647–651, fig. 1*).—In the course of the study of the biology and longevity of the ear tick three infertile females remained alive after 3 yr. and 8 mo., having been kept at a laboratory temperature of from 12° to 25° C.

A note on the members of the nematode genus Trichostrongylus occurring in rodents and lagomorphs, with descriptions of two new species, G. Dikmans (*Jour. Wash. Acad. Sci.*, *27* (*1937*), *No. 5, pp. 203–209, figs. 2*).—*T. ransomi*, obtained from the small intestine of a rabbit (probably *Sylvilagus floridanus alacer*) at Jeanerette, La., and *T. texianus*, from the small intestine of a prairie dog (*Cynomys ludovicianus arizonensis*) in Nolan and Runnels Counties, Tex., are described as new in this contribution, which includes a key for the separation of the species of the genus occurring in rodents and lagomorphs.

Metorchis albidus, a dog fluke new to North America, A. E. Freeman, Jr., and J. E. Ackert (*Amer. Micros. Soc. Trans.*, *56* (*1937*), *No. 1, pp. 113–115, fig. 1*).—Contributing from the Kansas Experiment Station, a record is made of the occurrence of *M. albidus* (Braun 1893) Looss 1899 at Los Angeles, Calif., the specimens being taken from the bile duct of an Eskimo Husky dog imported from Alaska. Previously, this parasite had been reported only from Europe.

ANIMAL PRODUCTION

[Investigations with livestock in Illinois] (*Illinois Sta. Rpt. 1936, pp. 66–87, 91–106, 110, 111, 120–123, figs. 2*).—Beef cattle studies reported include a comparison of different protein supplements for fattening beef calves, the value of bluegrass and alfalfa pastures and of lespedeza and soybean hays for fattening beef cattle, all by H. P. Rusk and R. R. Snapp; and the effect of pastures on the color of the fat and lean in beef, by S. Bull.

From swine studies results are noted on protein suplements for pigs on pasture, by W. E. Carroll and W. P. Garrigus; the value of rye pasture for fall pigs, by Carroll and W. Burroughs; and the effects of varying protein levels in the diet on the composition of pork, by Carroll, Garrigus, H. H. Mitchell, T. S. Hamilton, and W. T. Haines.

Sheep studies gave information on the comparative value of lespedeza and alfalfa hays for ewes and lambs, by W. G. Kammlade; and the minimum protein requirements of lambs, by Kammlade, Mitchell, Hamilton, and Haines.

Other animal nutrition experiments reported include the comparative nutritive value of dry-rendered v. digester tankage, by Mitchell, Hamilton, Haines, and J. R. Beadles; nut v. meat proteins, and the vitamin A content of yellow corn and soybeans, both by Mitchell and Beadles; the effects of varying the protein levels in the diet of rats, and factors affecting hemoglobin formation, both by Mitchell and Hamilton; and the comparative palatability of certain strains of corn, by E. Roberts and J. H. Quisenberry.

Results of poultry studies are noted on the practicability of forced molting, by L. E. Card, H. J. Sloan, and H. H. Alp; soybean oil meals as a source of protein for chicks, by Sloan and Card; and the vitamin E requirements of chicks, by Sloan, Card, and F. B. Adamstone.

[Livestock investigations in Missouri] (*Missouri Sta. Bul. 387* (*1937*), *pp. 6–10, 19–28, 31–35, figs. 5*).—Beef cattle studies yielded information on a comparison of alfalfa, soybean, and lespedeza hays for wintering native calves, creep-feeding winter calves, cane molasses as a substitute for corn in calf rations, and molasses-alfalfa supplement to grain rations for calves, all by E. A. Trowbridge, J. E. Comfort, and M. W. Hazen; limiting grain and maximum roughage

in beef production, by Trowbridge, Comfort, and H. C. Moffett; *pasture v. dry lot for full-feeding yearling steers*, by L. A. Weaver, Moffett, and Comfort; and *systems of grazing bluegrass pastures*, by Comfort and J. M. Poehlman.

Results are noted on soybean oil meal for fattening sows, forage crops for swine, and methods of swine management, all by Weaver; the essential nutrients for lactating sows and rearing orphan pigs, both by A. G. Hogan and C. E. Murphey; growth in draft colts, by Trowbridge and Moffett; methods of fat lamb production, by Weaver, A. J. Dyer, and C. S. Williams; anemia caused by deaminized casein and studies on the vitamin B complex, both by Hogan and L. R. Richardson; and the role of plant juice in the nutrition of laboratory animals, by Hogan and S. R. Johnson.

Reports of poultry tests include the nutritional requirements of poultry, by Hogan, H. L. Kempster, and E. M. Funk; the growth rate of chicks under normal conditions, by Kempster and Funk; the feed-purchasing power of the eggs laid by a hen, by Kempster; and the temperature of eggs incubated normally, the relation of the size of the egg clutch to hatchability, the relation of candling appearance to hatching results, effect of nesting materials and battery management on the keeping qualities of eggs, consumer preference as to the amount of thick white in eggs, determining egg weight relationships, and factors causing slipped tendons in turkeys, all by Funk.

[Livestock investigations in North Carolina] (*North Carolina Sta. Rpt. 1934, pp. 50, 51, 52–55, 57–59*).—Results are briefly reported on the value of crop gleanings for wintering cattle, the comparative gains on pasture of native v. grade Hereford calves and yearlings (including a comparison of reed pasture v. tame permanent pasture), steering and hogging down corn and velvetbeans, the effects of fertilizing permanent pasture on beef cattle gains, and the comparative quality of meat from native v. grade Hereford yearlings, by E. H. Hostetler, J. E. Foster, and L. I. Case; meat and wool characteristics resulting from the use of purebred mutton rams on native ewes, the effects of different rates of feeding on the efficiency of feed utilization by swine, and cottonseed meal for fattening pigs, all by Hostetler and Foster; and the effect of feeding various amounts of soybeans to pigs, by Hostetler and J. O. Halverson.

Nutrition experiments gave information on the quantitative vitamins B and G complex in cottonseed meal, soybeans, soybean meal, and linseed meal, by F. W. Sherwood and Halverson; the relation of gossypol to moisture content of cottonseed meal, by Halverson and F. H. Smith; and the vitamin A supplementing value of soybean and alfalfa hays in a cottonseed meal ration for beef cattle, by Halverson, Hostetler, Sherwood, and Foster.

Poultry studies reported include menhaden fish oil as a source of vitamin D for growing chicks, by Halverson and R. S. Dearstyne; the effects of protein levels on developing pullets; and factors entering into the successful production of summer broilers in the mountain section, including a comparison of fattening rations.

Canadian animal husbandry, J. W. G. MacEwan and A. H. Ewen (*Toronto: Thomas Nelson & Sons, [1936], pp. XIV+462, figs. [64]*).—This book is intended to serve as a text for students in agriculture and as a guide and reference to practical livestock breeders. The main sections deal with the principles of breeding, breeds of livestock in Canada, principles of nutrition, feeds, feeding and management of farm stock, marketing of livestock, and farm meats. Condensed feeding standards and a compilation of the composition and nutritive value of Canadian feeds are appended.

The Spangenberg fodder process: Results of trials at Hawkesbury Agricultural College, C. Walkden Brown (*Agr. Gaz. N. S. Wales, 48 (1937),*

Nos. 3, pp. 121–125, figs. 4; 4, pp. 187–190, figs. 3).—This process, patented in England in 1931, provides for the rapid sprouting of grains in an electrically heated cabinet through the use of a nutrient solution. This article presents a résumé of the work leading up to the invention, the claims of the inventor, and the principle and operation of the cabinet.

Experimental results showed that corn reached an average height of from 5 to 6 in. in 6 days, and the average weight ratio of seed to fodder produced was about 1:2.6. A loss of up to 20 percent in dry matter occurred during the sprouting process. In addition to corn, wheat, barley, rye, Japanese millet, sorghum, and field peas were successfully grown in the cabinet. Difficulties encountered included unevenness of flooding, temperature, and yield, mold development, slime formation, and patchy germination. It is suggested that a small cabinet of this nature might be used in market garden practices for preparing seeds for transplanting.

Influence of cobalt top-dressing on the cobalt status of pasture plants, H. O. Askew and J. K. Dixon (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 9, pp. 688–693*).—The results of pot and field experiments have shown that the application of as little as 10 lb. of cobalt chloride per acre as a top dressing on pastures caused a marked increase of the cobalt content of the pasture plants. Heavy applications of cobalt chloride proved toxic to certain of the plants, particularly white clover. Superphosphate was a satisfactory medium for admixture with cobalt salts, but lime had a depressing effect on the cobalt intake of pasture plants, especially when the cobalt was actually mixed with the ground limestone. It appears that the use of small amounts of cobalt salts for top dressing pastures may prove highly beneficial in overcoming livestock ailments on deficient areas.

Cobalt status of New Zealand soils, E. B. Kidson (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 9, pp. 694–707*).—Data are presented on the cobalt content of a large number of New Zealand soils. It is concluded that the determination of the cobalt content of the soil is not a satisfactory guide as to the necessity for using cobalt supplements for livestock.

Cobalt studies of animal organs from South Island (N. Z.) drench experiments, H. O. Askew and J. K. Dixon (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 9, pp. 707–716*).—In two series of experiments the organs of sheep on deficient pastures, particularly the liver, had an appreciably lower cobalt content than those of healthy sheep. Drenching lambs with cobalt increased the cobalt content of the organs, especially of the liver, kidney, and pancreas, although the final cobalt level attained was similar to that occurring in normal lambs. It appears that the cobalt content of the liver may be useful in diagnosing cobalt deficiency.

Further observations on the assay, distribution, and properties of the filtrate factor, T. H. Jukes (*Jour. Biol. Chem., 117 (1937), No. 1, pp. 11–20, fig. 1*).—Continuing this study (E. S. R., 76, p. 81), a revised method of assay is described involving a preliminary depletion period of 6 days on the basal deficient diet, followed by an assay period of 13 days on the test diets. The filtrate factor value assigned to a feed is equal to 100 divided by the percentage of the supplement which must be fed in the diet just to provide the level of filtrate factor for maximal growth on the heated diet under the conditions of the test. A proposed unit of the filtrate factor is one-tenth of the amount which will just provide for maximal growth when fed daily to a 3-week-old chick in conjunction with the heated basal diet. The distribution of the filtrate factor in certain feeding stuffs and human foods is reported.

Gizzard erosions in chicks were not prevented by the addition of the filtrate factor to the diet. The factor was readily removed from certain feeding stuffs by water extraction, and in aqueous solution was not destroyed by benzoyl chloride. It was soluble in 99.5 percent ethanol and was present in the filtrate from treatment with phosphotungstic acid. A marked difference exists in the distribution of the filtrate factor as determined in this study and that of the human pellagra-preventive factor, thus confirming a previous observation.

Comparative conformation, anatomy, and udder characteristics of cows of certain beef and dairy breeds, W. W. Swett, F. W. Miller, R. R. Graves, W. H. Black, and G. T. Creech (*Jour. Agr. Res. [U. S.], 55 (1937), No. 4, pp. 239–287, pls. 21, figs. 3*).—Continuing this line of investigation (E. S. R., 68, p. 518), a comparison was made of the weights and measurements of the body and of the internal organs and body parts and the mammary-gland development and udder structure of seven Hereford cows, two Holsteins, and one Aberdeen Angus. Also the milk and butterfat production of four of the Hereford cows, which were maintained under dairy herd conditions, was compared with that of the two Holsteins. The Herefords were all between 3 and 3.5 yr. of age and were comparatively small, averaging 826 lb. in weight; the Holsteins were both 4 yr. old, averaging 1,388 lb.; and the Aberdeen Angus was about 12 yr. old, weighing 1,565 lb.

When the ante-mortem data were compared on the basis of ratios based on height at withers or length of head, the body proportions of the animals in all three breeds were similar with respect to height and length measurements, which indicate scale, but were quite dissimilar with respect to such measurements as width and circumference of barrel or fore chest, which are directly affected by deposition of fat. In proportion to their empty body weight, the Herefords had larger organs than the Holsteins in all except the endocrine gland and visceral fats groups, and larger than the Aberdeen Angus in all except the urogenital, endocrine gland, and visceral fats groups. The Holsteins exceeded the Aberdeen Angus in all except the urogenital and endocrine gland groups. There was little difference in the dressing out percentage between the Herefords and Holsteins. Marked differences in udder weights and capacities of the three breeds were observed. Empty udder weights averaged 10.09, 26.25, and 44 lb. for Herefords, Holsteins, and Aberdeen Angus, respectively. However, the average udder capacity of the Holsteins was 520.33 and 359.78 percent greater than for the Herefords and Aberdeen Angus, respectively. In "relation of capacity to weight" of udder the Holsteins exceeded the Herefords by 130.12 percent, while the Aberdeen Angus was extremely low in this respect.

The four Herefords under dairy herd management produced an average of 557.45 lb. of milk and 27.66 lb. of fat in complete lactations averaging 211 days, and the two Holsteins averaged 14,276 lb. of milk and 492.5 lb. of fat in 364 days. While the extent to which the Holsteins exceeded the Herefords in udder weight and capacity does not approach the enormous differences in milk and butterfat production, it indicates that size and capacity of udder are the only items of those studied that had significant correlation with records of production.

Comparison of various forms of milo grain for fattening steers in the southern Great Plains, W. H. Black, J. M. Jones, and F. E. Keating (*U. S. Dept. Agr., Tech. Bul. 581 (1937), pp. 16, figs. 7*).—The data and conclusions set forth in this bulletin are essentially the same as those reported in Texas Station Bulletin 547 (E. S. R., 78, p. 87).

Report of three years' experience in the fight against deficiency diseases in cattle in farmer stocks on the island of Gotland [trans. title], O. Svanberg (*K. Landtbr. Akad. Handl. och Tidskr., 76 (1937), No. 3, pp. 354–394;*

Eng. abs., pp. 389–392).—The generally occurring deficiency diseases in cattle on this island were shown to be primarily a deficiency in phosphorus traceable to an aphosphorotic condition in the soil and vegetation. Control measures that have proved effective include the application of phosphoric acid to soils, the early harvesting of feed crops, the use of roots or other succulent forage as a supplement to hays, the administration of an inorganic source of phosphorus during winter feeding, and the selection of cattle which are resistant to this alimentary-deficient phenomenon. The effects of these conditions on sheep and horse husbandry are also briefly noted.

Studies on the heat sterilization of beef-wrapping materials, W. A. EMPEY (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *10* (*1937*), *No. 1*, *pp. 57–63*, *figs. 2*).—This study, conducted in cooperation with the Queensland Meat Industry Board, has shown that beef wrapping materials (hessian and stockinet) normally contain micro-organisms which are viable on suitable media at −1° C. When hessian, artificially inoculated with spores of *Penicillium* sp., *Mucor* sp., *Sporotrichum carnis*, and *Cladosporium herbarum*, was subjected to dry heat for varying periods of time, evidence was obtained that a 2-hr. exposure at 60° gave thorough sterilization of the wrapping material. Under commercial practice where it is necessary to sterilize large quantities of the wrapping material, it is indicated that a sterilizing room temperature of 88° for 44 hr. will give adequate sterilization providing each stack does not exceed 15 cu. ft. and if a free air space completely surrounds each stack.

An analysis of swine progeny records: Feeding and carcass data of hogs tested by the Dominion Experimental Farms under the Canadian Advanced Registry policy for swine, J. G. STOTHART (*Canada Dept. Agr. Pub. 550* (*1937*), *pp. 35*, *figs. 9*).—This publication describes the Canadian Advanced Registry policy for swine adopted in 1928 and presents the results of a study based on the data from 370 litters of pigs tested under this plan during a period of 6 yr., 1929–34. A steady improvement in the type and usefulness of brood sows for bacon production as measured by progeny tests was noted. Data presented include the average carcass scores, ages, weights, gain-to-feed ratios, carcass measurements, fat characteristics, belly grade, and percentage of various carcass cuts. The balance between percentage of ham, middle, and shoulder in the carcass did not change markedly. A slight increase in percentage of middle was accompanied by a corresponding decrease in percentage of ham. A study of the variability of all characters together showed 11 percent variability between stations, 5.1 percent between years, and 9.3 percent between sows, indicating that differences due to environment should be considered in selection or in comparing sows. It is suggested that in fixing the minimum-carcass score acceptable for Advanced Registration the use of the coefficient of variability of all sows tested under standard conditions would be highly desirable from the standpoint of selecting outstanding sows.

Determination of the most favorable months for farrowing pigs in Alabang, Rizal, G. MIÑANO (*Philippine Jour. Anim. Indus.*, *4* (*1937*), *No. 3*, *pp. 225–232*, *fig. 1*).—An analysis of the data on 1,026 litters of pigs obtained during a period of 17 yr. indicated that, under Philippine conditions, December, January, and February are the most favorable months for farrowing pigs and May and July the least favorable months, with a difference of 15.7 in the average percentage of pigs raised during the most favorable and least favorable periods.

The development of young pigs at different ages during suckling [trans. title], HOFMANN (*Ztschr. Schweinezucht*, *43* (*1936*), *No. 48*, *pp. 764*, *765*).—Growth data are presented on 2,496 litters of pigs, including 392 litters with from 3 to 5 pigs, 1,140 with from 6 to 8 pigs, 886 with from 9 to 11 pigs, and 78

with 12 or more pigs. Semiweekly weights were recorded between 14 and 56 days of age. Pigs from litters averaging 4, 7, and 10 pigs weighed on the average 4.97, 3.98, and 3.43 kg, respectively, at 14 days of age, and 14.37, 13.72, and 13.37 kg, respectively, at 56 days of age, indicating that pigs lighter at birth tend to grow more rapidly than heavier pigs under satisfactory nutrition and management conditions.

Recent advances in pig fattening in Denmark [trans. title], N. PETERSEN (*Ztschr. Schweinezucht, 43 (1936), No. 45, pp. 711–713*).—This article summarizes recent investigations in Denmark on feed utilization by fattening pigs and presents data on the average weight of pigs at various ages, average rates of feed consumption and live weight gains at various weights and ages, and a comparison of Danish and Swedish feeding standards. A feed consumption of 3.34 feed units per kilogram of live weight gain is considered a satisfactory average. Pigs of short conformation have a slightly higher feed requirement per unit of live weight increase than longer pigs because of greater fat deposition. From the standpoint of feed economy, intensive fattening is most economical, but too rapid fattening results in a lowered carcass quality. The feeding of bulky feeds during the last weeks of fattening is recommended as a means of retarding the rate of fattening and improving carcass quality.

New Swedish experiments on the protein requirements of fat pigs [trans. title], N. PETERSEN (*Ztschr. Schweinezucht, 43 (1936), No. 43, pp. 679–683, figs. 3*).—Experimental evidence is presented indicating that the protein requirement per feed unit for pigs decreased with increasing live weight, and that formerly accepted protein requirement standards are too low for the production of bacon pigs. A new standard of protein requirements is proposed, providing for 125 g of protein per feed unit for 20 kg pigs and decreasing 5 g per feed unit for each 10 kg increase in live weight to 90 g per unit for 90 kg pigs. Higher levels of protein intake resulted in digestive disturbances in small pigs but could be satisfactorily consumed by heavier pigs. Vegetable proteins alone gave unsatisfactory results but could be used to advantage in combination with milk byproducts or other animal proteins.

The use of whey in swine breeding [trans. title], A. KUBE (*Ztschr. Schweinezucht, 43 (1936), No. 46, pp. 727–729, figs. 3*).—Brood sows on pasture and with beets in addition in winter were fed whey ad libitum with satisfactory results. A consumption of about 20 l per sow daily in winter and up to 40 l in summer is reported. When additional protein supplement was provided a few days before farrowing and during the suckling period, the pigs were well nourished and were not troubled with digestive disturbances. Whey in limited quantities for pigs from 10 to 12 weeks old and ad libitum at 14 to 15 weeks of age proved satisfactory. Sour whey as used in this trial was unsafe for younger pigs, but it is suggested that fresh whey might be safely fed.

Chemical composition of the blood of the hen during its life cycle, V. G. HELLER and L. PURSELL (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 549–553*).—The Oklahoma Experiment Station has analyzed the blood of Rhode Island Red females at monthly intervals from 1 to 27 mo. of age., including both laying and nonlaying individuals over 8 mo. of age. Data are reported on urea nitrogen, nonprotein nitrogen, creatinine, uric acid, glucose, sodium, plasma chlorides, cell chlorides, total solids, ash, and refractive index. It is concluded that no significant changes occurred in any of the constituents determined during the first 2 yr. of the hen's life, and that no regular differences occurred between laying and nonlaying hens. Urea was lower, uric acid and glucose higher, while other constituents resembled the percentages found in the blood of other domestic animals.

The female genital eminence is not a measure of future egg production, J. C. HAMMOND and W. H. BURROWS (*Poultry Sci., 16 (1937), No. 4, pp. 285, 286*).—On the basis on 1,070 females which were classified as to type and size of genital eminence as day-old chicks and later used in laying hen nutrition experiments for 1 yr. by the U. S. D. A. Bureau of Animal Industry, it is concluded that the type or size of the genital eminence of the day-old chick is not related to adult mortality, age of sexual maturity, rate or persistence of laying, broodiness, or fertility or hatchability of eggs.

The relationship between early development and laying performance [trans. title], F. FANGAUF, A. HAENSEL, and M. HAEKEN (*Arch. Geflügelk., 10 (1936), No. 11–12, pp. 401–409; Eng. abs., pp. 408, 409*).—Results are reported on four groups of pullets, two of which were reared on a normal growing ration while the other two received additional protein in the form of milk. When the pullets reached laying age one normal and one milk-fed group received a laying mash containing a 30-percent protein supplement with only water to drink, while the other two groups received a ground feed ration with only milk to drink. The pullets raised on the milk diet were heavier and started laying earlier, but the total number of eggs laid during the 12-mo. period were similar for all groups. The lots raised on milk laid heavier eggs regardless of the type of laying ration, while the normally reared group receiving milk in the laying ration in turn produced heavier eggs than those which never received milk. No differences were observed in the hatchability of eggs from the different lots.

The relationship of artificial illumination to pullet raising in Hawaii, with special reference to partial molt and egg production, C. M. BICE and B. A. TOWER (*Hawaii Sta. Circ. 12 (1937), pp. 7, figs. 3*).—The practicability of artificial illumination for laying flocks under Hawaiian conditions is indicated. A 13-hr. day proved sufficient to maintain normal body weight and high egg production and to control partial molt in the flock. Normal egg size was maintained, and the average mortality was not increased by the use of lights.

The effect of supplementary heat on egg production, feed consumption, amount of litter required, and net flock income, C. E. LEE, S. W. HAMILTON, C. L. HENRY, and M. E. CALLANAN (*Poultry Sci., 16 (1937), No. 4, pp. 267–273*).—Based on 1 year's results with three pens of White Leghorns and one pen of New Hampshires housed in artificially heated houses for a 120-day winter period (average temperature about 40° F.) as compared with a similar number of pens in insulated unheated houses under New York conditions, it is tentatively concluded that annual egg production of both breeds is lowered by the use of supplementary artificial heat. Complete data on egg producton, feed, labor, litter, and heating costs and net income are presented. The net return per bird was not significantly different in the heated and unheated pens with New Hampshires, but was significantly in favor of the unheated pens with White Leghorns.

The influence of rations on the annual mean egg weight of pullets, E. W. HENDERSON (*Poultry Sci., 16 (1937), No. 4, pp. 274–284, figs. 2*).—In this study at the Iowa Experiment Station eight pens of 30 White Leghorn pullets each were employed. The pullets were all of similar breeding, and the general environment was so controlled that the type of ration constituted the principal variable. An all-mash basal ration of ground yellow corn, ground wheat, and ground oats 1:2:1 plus 3 percent of steamed bonemeal and 1 percent of salt was used, and the protein concentrates added to the basal ration of pens 1 to 8, respectively, were 15, 10, and 5 percent of dried buttermilk, 10 percent of meat-and-bone meal (50 percent protein), 5 percent each of dried buttermilk and meat-and-bone meal, 9 and 5 percent, respectively, of dried buttermilk and meat-

and-bone meal, 5 and 8 percent, respectively, of dried buttermilk and meat-and-bone meal, and 5 percent of meat-and-bone meal.

The annual mean weight of all eggs laid by the different lots varied from 48.4 to 50.1 g. Within the range of protein concentrates used, mean annual egg weight decreased significantly with increased percentages of protein in the ration and increased significantly with increase in number of eggs and number of clutches per month. There was no significant relationship between the rate of increase in egg weight for the first 4 mo. and percentage of protein in the ration. Dried buttermilk was not superior to meat-and-bone meal in its influence on egg weight.

The nitrogen balance of laying pullets, A. J. MACDONALD (*Poultry Sci., 16 (1937), No. 4, pp. 247–254*).—In this experiment, two Rhode Island Red pullets receiving a cereal ration supplemented with cod-liver oil and salt were kept on continuous nitrogen balance trials for 13 and 28 weeks, respectively. Considerable variations in the nitrogen balance occurred from week to week, but these apparently were not connected with egg production but rather with the appetite of the birds. A large feed consumption over a period usually resulted in a positive nitrogen balance, with no evidence that a period of high egg production was preceded by a marked storage of nitrogen. The results indicate further that the nitrogen requirements of laying hens can be supplied by rations containing less protein than is provided in the present accepted feeding standards.

Beneficial effect of non-saponifiable fraction of soy bean oil on chicks fed a simplified diet, S. H. BABCOCK, JR., and T. H. JUKES (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 720, 721*).—The California Experiment Station has obtained evidence confirming the findings of Goettsch and Pappenheimer (E. S. R., 76, p. 232) that the addition of the nonsaponifiable fraction of soybean oil to a simplified paralysis-producing diet will prevent the development of the characteristic paralysis. Chicks on the supplemented diet appeared normal, although definitely below normal in weight.

A study of the possibility of standardizing vitamin D preparations for growing chickens [trans. title], N. OLSSON (*Arch. Geflügelk., 10 (1936), No. 11–12, pp. 423–436, figs. 7; Eng. abs., p. 436*).—A method is described for determining the calcifying properties of a diet based on examination of X-ray photographs of the intertarsal joints of chicks. The distance between the calcification zones of the distal bone of the tarsus and of the metatarsus (designated as tmt value) is inversely proportional to the intensity of calcification in growing chicks at certain ages, and since calcification is dependent on the vitamin D intake of the chicks the tmt values may be a measure of this. Standardization of vitamin D supplements by this method can best be accomplished on 6-week-old chicks and requires that the vitamin D intake be sufficiently small to cause variations in the values. Rather large numbers of chicks must be included, since great individual variation in the vitamin D requirements of chicks was observed. Under the conditions of this test 0.175 percent of cod-liver oil or 1.59 percent of shark-liver oil in the diet was required for normal calcification in chicks to 8 weeks of age when the calcium : phosphorus ratio in the diet was 2 : 1.

A bioassay of certain protein supplements when fed to baby chicks, S. F. COOK and K. G. SCOTT (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 167–170*).—A series of chick feeding trials is reported in which five types of protein concentrate were fed as supplements to a well-balanced basal mixture. Types 1, 2, and 8 were commercial fish meals, type 4 a commercial casein, and type 5 a commercial meat scrap. Growth was comparable and approximately

normal on all types except for three lots which received no yeast. In all the groups where type 1 or type 2 fish meal was the only protein supplement, abnormalities in the chicks were encountered characterized by a high percentage mortality, excessive hemorrhages, low hemoglobin levels (inversely proportional to the fish meal concentration), and a pronounced increase in blood clotting time. Apparently this syndrome can be ascribed to the fish meals used in that they contained objectionable materials and/or lacked some accessory factor. It was not possible to produce this syndrome quantitatively by the use of other protein supplements.

Apparent intoxication in poultry due to nitrogenous bases, S. F. COOK and K. G. SCOTT (*Science, 82 (1935), No. 2133, pp. 465–467*).—Further studies were conducted in an effort to determine the cause of the syndrome described above. It was found that the two fish meals causing the syndrome were low in functional sulfur, and that at least a part of the symptoms were due to the presence of nitrogenous bases in the functionally low sulfur diets. Replacement of the functionally low sulfur fish meals by meat scrap, casein, or functionally high sulfur fish meal resulted in a definite decrease in the hemorrhagic symptoms. The addition to an otherwise nonhemorrhagic diet of tri-, di-, or monomethylamine, diethylamine, dipropylamine, isoamylamine, ergot, and nicotine produced symptoms similar to those on the low sulfur fish meal. Apparently the toxic effects of diets containing certain nitrogenous bases may be alleviated by the administration of materials rich in sulfur-containing amino acids or reducing agents derived from plant or animal materials, plus some haem compound if it is not otherwise present.

The syndrome induced in poultry by an intoxication factor and its relation to the antihemorrhagic factor, K. S. SCOTT and S. F. COOK (*Calif. Univ. Pubs. Physiol., 8 (1936), No. 11, pp. 135–145, fig. 1*).—Further trials are described in which groups of chicks received diets deficient in the antihemorrhagic factor, both in the presence and absence of nitrogenous bases, and also diets adequate in the antihemorrhagic factor both with and without nitrogenous bases. The absence of both the antihemorrhagic factor and nitrogenous bases resulted in hemorrhages, hemorrhagic anemia, greatly prolonged clotting time, and moderate lymphocytosis. The addition of nitrogenous bases to an antihemorrhagic-deficient diet increased the severity of anemia and also increased the leucocyte count, including the lymphocytes, polynuclears, and monocytes. When the diet contained the antihemorrhagic factor and also nitrogenous bases only slightly prolonged clotting time and slight hemorrhages occurred, but a nonhemorrhagic anemia and a greatly distorted blood picture, including a pronounced increase in lymphocytes, polynuclears, basophiles, and monocytes, were noted. These results indicate that in certain nutritional disturbances of poultry two factors may be involved, namely, the antihemorrhagic factor and an intoxication factor which consists of nitrogenous bases ingested in the ration.

The alleged intoxication factor in fish meal, H. J. ALMQUIST and E. L. R. STOKSTAD (*Poultry Sci., 16 (1937), No. 4, pp. 261–266*).—In view of the results reported above by Scott and Cook, experiments were conducted in which chicks were fed practical rations containing up to 20 percent standard feeding grade sardine meal. In no instance was there evidence of prolonged blood clotting time, leucocytosis, hemorrhage, or anemia caused by the "intoxication factor" in sardine meal. There were no statistically significant differences in blood composition between any of the groups. Prolonged blood clotting time and hemorrhage occurred only when the ration was deficient in the antihemorrhagic vitamin.

Factors producing and preventing perosis in chickens, V. G. Heller and R. Penquite (*Poultry Sci., 16 (1937), No. 4, pp. 243–246*).—The Oklahoma Experiment Station conclusively demonstrated that the factors responsible for the cause and cure of rickets in chicks did not affect perosis, and that in most instances excessive minerals in the diet only aggravated this condition. A basal ration of yellow corn, wheat gray shorts, alfalfa leaf meal, dried buttermilk, meat-and-bone scraps, bonemeal, cod-liver oil, and salt (66.25:5:3:15:5:4:1:0.75) was found to produce perosis in from 76 to 100 percent of the chicks receiving such a diet.

In the experiments described various materials were added to the basal diet or to the drinking water, and their effects on perosis were noted. Ether, alcohol, or water extracts of the various components of the basal ration, when added to the basal ration, did not further aggravate the condition. Water extracts of wheat bran, wheat gray shorts, wheat embryo, or alfalfa did not prove very effective in preventing perosis, but a drinking solution consisting of the water extract of rice bran largely prevented the occurrence of defective legs and resulted in larger, smoother, better-colored legs and accelerated growth. The ash of 70 lb. of rice bran added to 100 lb. of the basal ration also prevented perosis. There was evidence of a correlation between the manganese content of a ration and its curative properties, but the protective action of certain rations having no manganese additions indicated that other factors may be involved.

Sexing turkeys from hatching to maturity, J. C. Hammond and S. J. Marsden (*Poultry Sci., 16 (1937), No. 4, pp. 287, 288, fig. 1*).—This note from the U. S. D. A. Bureau of Animal Industry indicates that the sex of turkeys can be determined at any age by an examination of the genital papillae. The technic for examining different aged birds is described.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Illinois] (*Illinois Sta. Rpt. 1936, pp. 130–142, figs. 7*).—Results are briefly reported on methods of testing dairy sires, by W. W. Yapp, J. G. Cash, and W. L. Gaines; new hybrid strains of corn for silage, by W. V. Nevens and Yapp; legumes as silage crops, by Nevens and A. F. Kuhlman; and pasture improvement investigations.

Studies in the field of processing dairy products gave information on the effects of small quantities of chromium, such as might be derived from chromium alloy equipment and from chromate-bearing washing compounds, in the diet of rats, and a comparison of different nutrient agar media for making standard plate counts of bacteria, both by M. J. Prucha; the bacterial contamination of pasteurized milk from milk containers, by J. M. Brannon; and factors affecting the keeping quality of butter, by O. R. Overman.

[Investigations with dairy cattle and dairy products in Missouri] (*Missouri Sta. Bul. 387 (1937), pp. 35–41, 44–46, 52–57*).—Studies with dairy cattle gave information on the effect of an exclusive milk diet supplemented only with cod-liver oil and minerals on the growth, blood picture, and related physiological phenomena in dairy calves, by A. C. Ragsdale, H. A. Herman, and S. Brody; the growth and development of calves fed only alfalfa hay and milk, the effects of forced rapid growth on dairy calves, and a comparison of lespedeza, soybean, and alfalfa hays for milk production, all by Ragsdale and Herman; the energetic efficiency and monetary profit in milk production, by Ragsdale, Brody, and R. S. Cunningham; the diurnal variations in heat production and muscular activity, by Brody and V. Herring; respiratory quotients in dairy cattle, by

Brody and L. Washburn; the effect of udder irrigation and milking interval on milk secretion, by C. W. Turner and E. R. Garrison; seasonal variation in the birth rate of the milking goat, by Turner; the composition of the colostrum of the goat, by Turner and A. J. Bergman; precursors of the constituents of milk, by Turner, W. R. Graham, Jr., and E. T. Gomez; methods of predicting milk- and butterfat-producing abilities of dairy cattle, by Turner and A. S. Foot; and factors affecting the length of gestation in dairy cows, by Herman and C. Elder.

Dairy cattle management and pasture improvement studies by Ragsdale and C. W. McIntyre at the Hatch Experiment Farm are noted.

Results of studies with dairy products are noted on methods of determining lactose in milk, by Garrison; the chemical and bacteriological properties of milk from mastitis-infected quarters, by Garrison and Herman; and macro- and microphotographic studies of the crystalline structure of ice creams and sherbets and of certain factors affecting the moisture migration in butter, and the relation of air conditioning to flavor and texture in ice cream, all by W. H. E. Reid.

[Dairy cattle investigations in North Carolina] (*North Carolina Sta. Rpt. 1934, pp. 49, 52*).—Results are noted on lespedeza as a supplementary pasture for dairy cattle, the comparative value of *Lespedeza sericea* v. alfalfa and peanut v. soybean hays for milking cows, by C. D. Grinnells; and dairy pasture improvement studies at the Central and Mountain Substations, by Grinnells, S. C. Clapp, and H. Coulter.

[Investigations with dairy cattle and dairy products in Vermont] (*Vermont Sta. Bul. 425 (1937), pp. 22–26*).—Progress is reported on dairy cattle studies dealing with calcium and phosphorus metabolism of milk cows, the effect of feeding cod-liver oil concentrate with different grades of hay to dairy calves, methods of ensiling legumes and grasses, and the comparative digestibility and feeding value of artificially dried roughages, silages, and hays. Data as to the causes of excessive losses of butterfat in the various steps of processing dairy products are noted.

Observations on the carotene content of some typical pasture plants, F. W. Atkeson, W. J. Peterson, and A. E. Aldous (*Jour. Dairy Sci., 20 (1937), No. 8, pp. 557–562, figs. 3*).—This report from the Kansas Experiment Station presents data on the carotene content of 13 plants, typical of those used for pasture in that State. For most plants from 2 to 5 samples representing seasonal conditions were analyzed. All plants showed a relatively high carotene content in early summer, although rather wide variations among the different species were noted. During midsummer all plants showed a marked decrease in carotene content, but with the more rapid fall growth it increased in most species and reached early summer levels in some cases. In a few species, notably big bluestem and buffalo grass, the fall growth was practically devoid of carotene.

Nutritive value for dairy cows of alfalfa hay injured by sulphur dioxide, O. C. Cunningham, L. H. Addington, and L. T. Elliot (*Jour. Agr. Res. [U. S.], 55 (1937), No. 5, pp. 381–391, figs. 4*).—Alfalfa hay grown in close proximity to a commercial smelting plant and showing marked evidence of sulfur dioxide injury (over 25 percent of leaves acutely marked) was compared with normal alfalfa of the same grade in an experiment conducted by the New Mexico Experiment Station. Ten high-producing dairy cows were used in a double reversal feeding trial involving three 30-day experimental periods. A ration of mixed grain, corn silage, and alfalfa hay was employed, with the injured hay being fed in the first and third periods and the normal hay during the second.

Also the last 10 days of each 30-day period were used to determine the apparent digestibility of the two rations. No significant differences were found in the apparent digestibility of the various constituents of the rations, in the amounts of dry matter consumed, or in the percentage of ingested energy returned in milk when results from feeding the two hays were compared.

Chemical changes in the making of A. I. V. alfalfa silage and nutritive qualities of milk produced therefrom, W. H. Peterson, H. R. Bird, and W. M. Beeson (*Jour. Dairy Sci., 20 (1937), No. 9, pp. 611–623, figs. 2*).—This line of investigation has been continued (E. S. R., 73, p. 376), with special emphasis upon the fermentative changes occurring in the silage and upon certain aspects of the feeding trials. Forty-two tons of unchopped alfalfa were ensiled by the A. I. V. method and six barrels were filled with chopped alfalfa, five receiving acid and the sixth left as a control with no acid.

The data presented on fermentation products found after 5 weeks and 5 mo. in the barrels and after 6½ and 11 mo. in the large silo indicated that alfalfa ensiled by the A. I. V. method had made large gains in amino and water-soluble nitrogen but only small increases in ammonia nitrogen. The content of volatile acids, ethyl alcohol, and lactic acid indicated that micro-organisms similar to those present in corn silage were active, and plate counts showed a large number of micro-organisms to be present at the various stages. The alfalfa ensiled without acid showed enormous numbers of bacteria and produced large quantities of ammonia and butyric acid. In all cases there was an increase in carotene values during storage, although it is doubted that the increase accurately represented carotene. Cows fed A. I. V. silage during the winter months produced milk containing about 50 percent more carotene and 40 percent more vitamin A than milk produced on a well-balanced winter ration including alfalfa hay and corn silage. However, the milk produced on the A. I. V. ration was somewhat lower in both carotene and vitamin A than that from cows receiving the same dry weight equivalent of green alfalfa or that from cows on pasture. Rats fed on mineralized milk from the A. I. V. ration grew more rapidly than those fed mineralized milk from the cows on the normal winter ration, but no appreciable difference in growth rates was observed in rats fed milk from A. I. V. silage, green alfalfa, or pasture.

Management and breeding data on a dairy herd in which Bang's disease (infectious abortion) was eradicated by segregation, F. W. Miller, R. R. Graves, and M. H. Fohrman (*Jour. Dairy Sci., 20 (1937), No. 8, pp. 537–550*).—This report from the U. S. D. A. Bureau of Dairy Industry presents information on the management and breeding efficiency of a dairy herd for a period extending from May 10, 1926, when the herd was divided into abortion-negative and abortion-positive groups, until October 4, 1935, when the abortion-positive group was terminated. At the time of separation there were 65 and 82 females of breeding age in the negative and positive groups, respectively, and during the period 80 cows from the negative group were added to the positive group.

Division of the herd alone was not effective in preventing spread of the disease, but with separate crews caring for the two groups and with strict supervision of all communication between the two groups, spread was stopped. Calves born in the abortion-positive group received milk from that group until from 50 to 60 days of age, then milk from the negative herd for 10 days, after which they were isolated for an additional 10 days before being placed with calves in the negative group. The same bulls were bred to both herds with no evidence of spread by this practice. The 80 animals becoming positive during the period required more services per conception, had a smaller percentage of conceptions, and a smaller percentage of pregnancies terminating in normal

calvings than any other group. The positive cows required more services per conception when bred after an abortion than when bred after normal calving.

Working maintenance as a function of live weight in dairy cows, and its bearing on an energy-size index of lactation, W. L. GAINES (*Jour. Dairy Sci., 20 (1937), No. 9, pp. 583–598, figs. 2*).—This contribution from the Illinois Experiment Station offers a critical comparison of the validity of the exponent 1.00 proposed by Haecker (E. S. R., 14, p. 1003) and the exponent 0.73 proposed by Brody and Proctor (E. S. R., 73, p. 663) for relating the live weight of dairy cows to their working maintenance requirement.

Employing essentially the same data as used by Brody and Proctor in deriving their equation $DN''=0.053W^{0.73}$, in which DN'' is the pounds of total digestible nutrients per day for working maintenance and W the live weight of the animal, the author reports that for that portion of the group showing a gain in weight a better fit was obtained by the formula $DN''=0.369W^{0.48}$ and for those animals showing a loss in weight by $DN''=0.021W^{0.87}$. It is concluded that the results of the whole analysis were too variable and uncertain to be regarded as necessitating any change in Haecker's $DN''=0.008W$ for dairy cows in milk. In a comparison of a number of given formulas for expressing efficiency or energy-size relationships, preference is expressed for the simple formula FCM/IW, in which FCM is the milk energy yield for some suitable uniform period of the lactation and IW is the live weight of the cow at the start of the period.

The effect of breed characteristics and the plane of nutrition of the cow on the vitamin A potency of milk, A. O. SHAW, S. I. BECHDEL, N. B. GUERRANT, and R. A. DUTCHER (*Jour. Dairy Sci., 20 (1937), No. 8, pp. 521–535*).—This study at the Pennsylvania Experiment Station consisted of four distinct phases. All milk samples from individual cows were assayed for vitamin A potency by the usual rat feeding tests. In the first phase Guernsey and Holstein cows were fed a good dairy ration consisting of good quality dehydrated clover hay and a well-balanced grain mixture. There was a marked variation in the vitamin A potency of milk from different individuals within a breed as well as between the breeds but, in general, milks produced by Guernsey cows were higher in vitamin A than Holstein milks. In the second phase Guernsey and Holstein cows were fed a ration extremely low in pigment consisting of low quality timothy hay, dried beet pulp, and a grain mixture. After 7 mo. on such a ration the vitamin A content of the milk from each breed had decreased approximately 70 percent, the response to adverse feeding being quite uniform for the two breeds. When the above cows, depleted of their vitamin A reserves, were fed 150,000 A. D. M. A. units of vitamin A per cow daily in the form of carotene, no noticeable increase in the vitamin A potency of the milk was observed over a 12-day experimental period. In the final phase, assay of milks from Guernsey, Jersey, Holstein, Ayrshire, and Brown Swiss cows receiving identical rations showed considerable variation in vitamin A potency per unit volume for the different breeds but approximately the same potency per gram of milk fat for all breeds, leading to the conclusion that the vitamin A potency of the various dairy breeds is proportional to the percentage of milk fat characteristic of the breed.

The composition of milk and whey, with special reference to the partition of calcium and phosphorus, E. R. LING (*Jour. Dairy Res. [London], 8 (1937), No. 2, pp. 173–194, figs. 15*).—This report from Midland Agricultural College, England, is based on the analysis of 54 samples of mixed herd milk collected at regular intervals (alternate morning and evening) over a 13-mo. period from a Dairy Shorthorn herd. No outstanding differences in composi-

tion were evident between the morning and evening samples, but the time of rennet coagulation was appreciably greater for evening samples, which is partially attributed to the longer time evening milk was in cold storage. Data are presented on the partition of calcium and phosphorus into their soluble and insoluble, organic and inorganic phases. The time of rennet coagulation was found to decrease with increasing serum acidity and with an increasing soluble inorganic phosphorus/soluble calcium ratio and to increase with an increasing soluble calcium content. This anomalous effect of soluble calcium is believed to be associated with the action of di- and tricitrates and diphosphates in prolonging rennet coagulation. A study of the relationship between caseinogen and other constituents gave evidence that this protein is associated with tricalcium phosphate in a physical rather than in a chemical manner, the amount so held by caseinogen being closely related to the acidity per gram of this protein.

The comparative value of milk agar and standard agar for the bacteriological examination of raw and pasteurized milk, S. B. THOMAS (*Welsh Jour. Agr., 13 (1937), pp. 287–295*).—In a study at University College, Aberystwyth, comparing the bacterial count of 265 samples of raw milk and 53 samples of pasteurized milk, the addition of 1 percent skim milk to standard agar increased the colony count by a ratio of 1.9 in raw milk and 4.8 in pasteurized milk when both the standard and modified media were incubated at 37° C. The parasitic streptococci present in mastitis milk were able to grow as pin-point colonies on the milk agar, counts of over 10 million per milliliter frequently being obtained. The milk agar proved to be more suitable than yeast dextrose agar for the growth of thermophilic bacteria at 55° or at 63°.

Thermophilic bacteria in raw and pasteurized milk, S. B. THOMAS (*Welsh Jour. Agr., 13 (1937), pp. 295–308*).—In further studies a comparison of direct microscopic examination, colony counts at 55° and at 63° C., methylene blue reduction at 55° and 63°, fermentation in 48 hr. at 55° and 63°, and miscroscopic examination after incubation indicated that the methylene blue reduction test combined with the fermentation test at 63° was the most sensitive method of detecting the presence of thermophiles in raw and pasteurized milk, while quantitative results were best obtained by plating on milk agar (described above) at 63° for 2 days. Thermophiles were detected in most samples of raw milk produced under unsanitary conditions but in only 3 percent of the clean raw samples. These organisms were isolated from hay, straw, silage, bran, and cow manure. A brief description of the morphology and cultural characteristics of some thermophiles isolated from milk is presented.

The comparative values of the colony count on milk agar, the coliform test, and the methylene blue reductase test for the grading of raw milk, S. B. THOMAS and J. A. TUDOR (*Welsh Jour. Agr., 13 (1937), pp. 308–317, figs. 2*).—A comparison of results obtained in the examination of 400 summer-produced and 400 winter-produced samples of raw milk led to the conclusion that the methylene blue test alone is a much more lenient method of grading milk supplies than the combined plate count and coliform test, as previously used, but that a combination of the methylene blue reduction and coliform tests set a standard very similar to the combined plate count-coliform test. Comparative results of these three methods are presented.

Further studies on skim milk agar for routine milk counts, C. E. SAFFORD and C. N. STARK (*Jour. Dairy Sci., 20 (1937), No. 9, pp. 577–581, figs. 3*).—Continuing this line of investigation (E. S. R., 74, p. 252), the authors have compared the bacterial counts of 190 samples of pasteurized milk when plated on standard agar and on tryptone-glucose agar plus 0.5 and 2 percent skim milk.

Using arithmetical averages of percentage differences, the 0.5 percent skim milk agar counts were 180 percent higher and the 2 percent skim milk agar counts 215 percent higher than the corresponding standard agar counts. The 2 percent skim milk agar also possesses superior differential value for bacterial types, which is considered especially advantageous in the bacterial examination of such products as butter, cheese, and starters.

Data pertaining to studies on the comparative fairness of single can and weigh vat samples of milk for bacterial counts as a basis of premium payments to grade A dairymen, M. W. Yale and R. S. Breed (*New York State Sta. Mimeogr. Bul. 2 (1936), pp. [23]*).—This is a presentation of the data upon which the discussions and conclusions set forth in Bulletin 673 (E. S. R., 76, p. 91) are based. This material is issued in very limited edition.

The creaming power of heated milk: The relationship between the denaturation of albumin and globulin and the reduction in creaming power, S. J. Rowland (*Jour. Dairy Res. [London], 8 (1937), No. 2, pp. 195–202, figs. 2*).—In this study at University College, Reading, determinations were made of the amounts of albumin and globulin denatured and of the changes in creaming power produced by heating milk samples for 30 min. at temperatures of 57.5°, 60°, 61.5°, 63°, 65°, 67.5°, 70°, 74.8°, and 80° C. Heating at the lower temperatures caused an increase in the creaming power of the milk with the maximum occurring at 60,° while at 62° the creaming power was equal to that of raw milk. Heating above 62° resulted in progressive and rapid reduction of creaming power. This reduction at temperatures above 60° was proportional to the percentage of total albumin and globulin denatured or to the residular soluble albumin and globulin content of the milk. Increase in the creaming power of samples heated up to 62° is explained on the basis of viscosity changes. It is concluded that the denaturation of albumin and globulin, especially the latter, is a major factor in the reduction of creaming power of heated milk.

Oxidized flavor in milk.—V, The effect of metal-developed oxidized flavor on the iodine number of the milk fat, W. C. Brown, R. B. Dustman, and L. M. Thurston (*Jour. Dairy Sci., 20 (1937), No. 9, pp. 599–604*).—Continuing this series (E. S. R., 77, p. 385), 12 trials were conducted with winter-produced milk in which the iodine number of the milk fat was determined from fresh samples and from lots of the same milk in which a moderate to fairly pronounced oxidized flavor was induced by the addition of copper. No change in iodine number of the milk fat could be detected. This is considered as evidence that some constituent of milk other than fat is the one in which off-flavors arise when moderate to fairly pronounced oxidized flavor is produced.

The composition of mare's milk.—II, The variation in composition during lactation. III, The influence of intra-mammary pressure on the composition of milk with special reference to the mare and cow, R. G. Linton (*Jour. Dairy Res. [London], 8 (1937), No. 2, pp. 143–172, figs. 5*).—Continuing this series (E. S. R., 69, p. 409), determinations were made on the composition of the milk of 8 Shetland ponies and 1 Clydesdale mare at frequent intervals throughout their lactation periods when the animals were kept under normal conditions on pasture. It was shown that the percentage composition of mare's milk changed in a definite manner with advance of the lactation period, the percentage of total solids, lactose, and fat increasing in a linear manner and the percentage of solids-not-fat, protein, calcium, and phosphorus decreasing lineally. The calcium-phosphorus ratio remained quite constant throughout the period. It is obvious that in judging normality of a sample the period of lactation as well as the percentage composition must be known, and that random

samples are of little value in this respect. With either cows or mares intramammary pressure caused by sudden cessation of the removal of the milk from the udder was an important factor in changing the composition of milk.

The theory of butter-churning, W. CLAYTON (*Food, 6 (1937), No. 72, pp. 475, 476, fig. 1*).—A critical discussion of certain theories concerning the churning process, with evidence to substantiate the theory that churning results in a breaking of the cream emulsion due to foam formation and the resulting accumulation of the milk proteins at the newly created and extensive air/liquid interface.

Delaying oxidative changes in butter, C. D. DAHLE and D. V. JOSEPHSON (*Natl. Butter and Cheese Jour., 28 (1937), No. 18, pp. 18–21*).—In tests conducted at the Pennsylvania Experiment Station additions of commercial oat flour at the rate of 1 percent of the fat weight in the cream and of aqueous extracts of oat flour (equivalent to 0.5, 1, and 1.5 percent of oat flour) were made to various grades of cream before pasteurization and churning in an effort to control surface oxidation of butter during storage. The direct addition of oat flour materially retarded the oxidative deterioration in butter stored at 40°–45° F. over 6–8 weeks, as indicated by the flavor score, but the resulting sediment in the butter and a positive test for starch made this method of using the oat flour undesirable. The addition of the aqueous extract equivalent to 1 percent of oat flour offered similar protection to the butter with none of the undesirable effects noted from the flour. It is shown that the peroxide value of the butter is of less value than the actual flavor score in detecting oxidative deterioration.

Stabilization of butter against oxidized flavors, V. L. KOENIG (*Natl. Butter and Cheese Jour., 28 (1937), No. 15, pp. 26, 28, 30*).—The Oklahoma Experiment Station has compared the flavor score of butter wrapped in ordinary parchment (control) with that of lots of the same butter wrapped in parchment specially treated with oat flour and with other lots which were mixed with 0.06 percent of a hexane extract of oat flour and wrapped in ordinary parchment, samples of all lots being stored at 0° and 50° F. and scored at frequent intervals over a 17-week storage period. The butter wrapped in treated parchment scored higher than the control samples at all stages of the test. The butter which was mixed with the hexane extract had a distinct off-flavor at both storage temperatures for the first 4 weeks of storage, but after that time it was the highest scoring butter of the three lots. It is concluded that the addition of a hexane extract of oat flour to butter exerted a greater inhibiting action to the development of tallowiness and rancidity than did the use of parchment wrapping treated with oat flour, but that the latter method inhibits sufficiently to undoubtedly justify its use.

Improving the keeping quality of butter with treated parchment, C. D. DAHLE and D. V. JOSEPHSON (*Natl. Butter and Cheese Jour., 28 (1937), No. 14, pp. 6, 7*).—The comparative keeping qualities of butter wrapped in ordinary parchment and in parchment treated with oat flour when held at various storage temperatures have been studied by the Pennsylvania Experiment Station. With butter stored at 45° F. the treated parchment had a beneficial effect in retarding flavor defects which start at the surface, surface staleness always appearing in the control samples earlier than in those samples wrapped in the treated parchment. The effect of treated parchment was slight when butter was stored at −15°, none of the butter showing much deterioration in score during storage, but when samples were removed from cold storage and held at higher temperatures for two weeks the beneficial effect of the treated parchment was again evident.

The rheology of cheese, butter, and other milk products: (The measurement of "body" and "texture"), J. G. DAVIS (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 2, pp. 245–264, figs. 17*).—This paper deals primarily with methods of measuring certain physical properties of cheese and other products of a plastic nature. The properties considered include (1) elasticity, (2) viscosity, (3) time of relaxation, (4) internal viscosity, (5) structural viscosity, (6) work hardening, (7) true hysteresis, and (8) relaxation flow. The apparatus and experimental technic employed are fully described, and results are graphically presented. The relation of the physical properties of cheese and butter to quality of the finished product and the need of methods for more accurately determining the body and texture of these products are discussed.

Studies in Cheddar cheese.—VI, The degradation of milk proteins by lactic acid bacteria isolated from cheese, alone, with sterile rennet, and with whole rennet, J. G. DAVIS, W. L. DAVIES, and A. T. R. MATTICK (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 2, pp. 238–244*).—Continuing this series (E. S. R., 77, p. 537), it was shown by in vitro experiments with milk that the enzymes of commercial rennet in conjunction with the lactic acid bacteria occurring in Cheddar cheese can cause protein break-down similar in extent to that found in ripe cheese so far as the nonprotein nitrogen is concerned, although the amino nitrogen produced is much less than in ripened cheese. This latter condition is ascribed to the lower pH of the milk culture as compared with cheese, since it is known that acidity adversely affects the peptidases present.

Pasteurization of milk for cheese making, C. D. KELLY (*New York State Sta. Circ. 175* (*1937*), *pp. 7*).—The development of pasteurization in the cheese industry, the desirability of pasteurization, and problems encountered in making cheese from pasteurized milk are briefly discussed.

Lactic bacteria in relation to cheese flavour.—I, I. R. SHERWOOD (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 2, pp. 224–237*).—This report from the New Zealand Dairy Research Institute describes trials in which various strains of lactobacilli isolated from Cheddar cheese were added to cheese milk. Different strains of these organisms were found to impart specifically characteristic flavors to the cheese, including many which were commonly encountered in commercial cheese such as pleasant aromatic, diacetyl-like, metallic, bitter, unclean, and fermented. Inoculation of cheese milk with natural mixtures of lactobacilli from mature cheeses usually caused the development of unclean fermented flavors, indicating that while such organisms are commonly present in normal mature cheeses the actual numbers present are too small to spoil the flavor. The group of lactobacilli are considered the most important flavor-forming factor in normal Cheddar cheese.

Cheeses of New York State, C. D. KELLY and J. C. MARQUARDT (*New York State Sta. Circ. 174* (*1937*), *pp. 8, fig. 1*).—The various types of cheese manufactured in significant quantities in the State are briefly described, and a map indicating the important cheese-producing areas and the types of cheese for which each is noted is presented.

Sodium alginate as a stabilizer for ice cream, E. O. ANDERSON, L. R. DOWD, and H. HELMBOLDT (*Ice Cream Rev.*, *20* (*1937*), *No. 11, pp. 88, 90, 91*).—This article presents results essentially confirming previous reports by Mack (E. S. R., 77, p. 98) and by Stebnitz and Sommer (E. S. R., 77, p. 537) on the desirability of sodium alginate as a stabilizer for ice cream.

Preventing flavor defects in ice cream caused by fat oxidation, C. D. DAHLE and D. V. JOSEPHSON (*Ice Cream Rev.*, *20* (*1937*), *No. 11, pp. 31–34*).—The Pennsylvania Experiment Station has studied the effect of adding com-

mercially prepared oat flour to ice cream mixes on the occurrence of oxidized flavor in the mixes and in the frozen ice cream after several weeks of storage. Various lots studied included both homogenized and unhomogenized mixes and ones prepared from summer-produced and winter-produced milks and strawberry and vanilla ice creams. In most instances copper was introduced into the mixes at the rate of 2 p. p. m. to accelerate the development of oxidized flavor. The addition of from 0.5 to 0.7 percent of the oat flour delayed or prevented the onset of oxidized flavors for several weeks in most cases. Additions of 0.5 percent to 2 percent of oat flour to fresh cream before being frozen afforded definite protection against oxidized flavor in ice cream mixes employing such frozen cream (frozen 130 days) as the sole source of butterfat. The body score of the ice cream was favorably affected at either 0.5- or 0.7-percent levels, but more than 0.5 percent unduly increased the viscosity of the mix. The addition of 0.5 percent of oat flour to ice cream mixes is recommended. It can best be added by thoroughly mixing it with the sugar, and direct addition to the liquid mix is not recommended.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 87–91, 106–110, 111–120, 123, figs. 6*).—Reporting upon the activities of the year (E. S. R., 77, p. 390), by R. Graham, C. A. Brandly, F. Thorp, Jr., J. P. Torrey, H. W. Johnson, E. H. Barger, G. L. Dunlap, L. E. Boley, E. Roberts, and L. E. Card, reference is made to studies of methods of testing for and status of the control of Bang's disease, progress in the experimental study of Johne's disease, horse parasite control work, progress in experiments with cornstalk disease of horses, control work with pullorum disease, study of laryngotracheitis vaccine, studies of filtrable virus diseases of domestic animals, value of sanitation in disease control, and breeding for resistance to pullorum disease.

[Work in animal pathology and parasitology by the Missouri Station] (*Missouri Sta. Bul. 387 (1937), pp. 95–101, 112, 113*).—Report is made of the work of the year (E. S. R., 76, p. 689), including fowl paralysis, fowl leucosis, and blackhead in turkeys, all by A. J. Durant and H. C. McDougle; cattle with low titer reaction to the Bang agglutination test, by C. Elder; comparative results of tube agglutination and rapid or plate tests on low-reacting serums, by Elder and P. L. Piercy; the significance of low agglutination reaction in unbred virgin gilts and transmission of Bang's abortion infection from swine to cattle under pasture conditions, both by Elder; toxemia in sheep, by Elder and A. W. Uren; tapeworms in sheep, by Elder; and routine control work, by Piercy, Durant, and McDougle.

Animal diseases (*[Gt. Brit.] Agr. Res. Council Rpt., 2 (1933–35), pp. 69–98*).—The work conducted in animal pathology and parasitology is reported upon, particularly that relating to braxy and braxylike diseases of sheep; tuberculosis of livestock; Bang's disease; Johne's disease; bovine mastitis; hog cholera, necrotic enteritis, and similar diseases of pigs; sheep blowflies; fowl paralysis and allied diseases and coccidiosis; and blackhead in turkeys.

Annual report of the department of veterinary science and animal husbandry, 1935, H. J. Lowe et al. (*Tanganyika Dept. Vet. Sci. and Anim. Husb. Ann. Rpt., 1935, pp. 155, pls. 8, figs. 19*).—In addition to the report on the occurrence and control of infectious diseases and parasites of livestock (E. S. R., 74, p. 540), some notes on *Brucella* infection in Tanganyika, by S. A. Evans (pp. 21–25), and salt poisoning of fowls, by M. H. French (pp. 25–27), are pre-

sented. Research work reported upon includes trypanosomiasis of pigs due to *Trypanosoma simiae*, by H. E. Hornby (pp. 43–48), studies concerning the effect of the plane of nutrition on the course of animal trypanosomiasis, by M. H. French and H. E. Hornby (pp. 49–73), and the nitrogen and mineral metabolism during a chronic case of *T. congolense* disease in an ox (pp. 73–77), the nitrogen and mineral metabolism during acute infections of sheep with *T. brucei* (pp. 77–81), and a preliminary blood survey of the cattle on the volcanic regions in the Northern Province (pp. 81–88), all by M. H. French.

Veterinary division.—Annual report, 1935, C. R. TURBET (*Fiji Dept. Agr. Ann. Bul., 1935, pp. 32–41*).—The occurrence of and control work with infectious diseases and parasites are reported upon (E. S. R., 74, p. 694).

[Contributions on animal pathology] (*Indian Sci. Cong. Proc. [Calcutta], 23 (1936), pp. 486, 487, 488*).—Among the contributions presented are the following: The Nature of the Allergic Reaction in Tuberculosis (p. 486), and An Easy Method of Transplanting Tubercle Bacilli Directly From Solid to Liquid Culture Media (p. 487), both by M. B. Soparkar, and Pneumonia in Foals Due to *Corynebacterium equi*, by V. R. Rajagopalan (pp. 487, 488).

The chemistry of stock-poisoning plants, J. F. COUCH (*Jour. Chem. Ed., 14 (1937), No. 1, pp. 16–30, figs. 27*).—An address summarizing information on the subject, presented with a list of 119 references to the literature.

Range studies of bitterweed, V. L. CORY and W. H. DAMERON (*Southwest. Sheep and Goat Raiser, 7 (1937), No. 11, pp. 8, 9, 32, 33, figs. 3*).—This is a practical summary of work with *Actinea odorata* conducted by the Texas Experiment Station from 1931 to 1936, inclusive (E. S. R., 68, p. 673).

Selenium distribution in and seasonal variation of type vegetation occurring on seleniferous soils, O. A. BEATH, H. F. EPPSON, and C. S. GILBERT (*Jour. Amer. Pharm. Assoc., 26 (1937), No. 5, pp. 394–405, figs. 6*).—An attempt is made in this contribution to show that the amount of selenium in a seleniferous plant is not constant nor its distribution in the plant uniform in any one part during a growing season. See also previous work (E. S. R., 73, p. 843; 76, p. 533).

Selenium in Hawaii and its probable source in the United States, H. G. BYERS, K. T. WILLIAMS, and H. W. LAKIN (*Indus. and Engin. Chem., 28 (1936), No. 7, pp. 821–823, fig. 1*).—A sample of lava covered with a sulfur deposit, secured near Kilauea on the island of Hawaii, when ground and the lava and sulfur together tested for selenium, was found to contain 0.14 percent. Seven soil profiles from the island of Hawaii, five from Maui, one from Molokai, and one from Kauai were examined for selenium with positive results, the analyses being reported in detail.

The conclusion that selenium from the Hawaiian soils is derived chiefly from the volcanic gases or sublimates, and is carried down into the soils by rain and there held in a highly soluble form, is considered warranted.

The excretion of selenium and its distribution in the tissues, M. I. SMITH, B. B. WESTFALL, and E. F. STOHLMAN (*Jour. Pharmacol. and Expt. Ther., 60 (1937), No. 2, pp. 119, 120*).—The excretion level of selenium in relation to its intake and its distribution in the tissues is dealt with in this contribution.

Note on "Prontosil" poisoning in mice, C. L. OAKLEY (*Biochem. Jour., 31 (1937), No. 5, pp. 729, 730*).—The author has found that when single large doses (40 mg), or repeated small doses (1 mg), of Prontosil are given to mice by mouth, the great majority of the animals become deeply pigmented, later show signs of illness, and not uncommonly die. With large doses, death may occur in a few days. With a daily dose of 1 mg, though pigmentation appears early, symptoms may be delayed for a month. In the latter case withdrawal

of the drug relieves the symptoms. The author considers it quite evident that Prontosil, which is not very soluble in water and even less soluble in the presence of salts, is filtered through the glomeruli and then precipitated during concentration of the filtrate in the tubules, precipitation being favored not only by abstraction of solvent but also by increase in the concentration of salts. The calculi so formed produce a partial and increasing obstruction to tubular outflow, leading to dilatation of the tubules and then of the kidney, and finally to death from renal failure.

Erysipelas treated with Prontosil, G. E. Breen and I. Taylor (*Lancet [London], 1937, I, No. 23, pp. 1334–1336, figs. 3*).—The authors report upon a series of 46 cases of erysipelas in which treatment with Prontosil was found to be of undoubted value. The drug is best administered by mouth. Repeated doses are necessary in order to maintain the requisite concentration, and these are more easily administered by mouth than by repeated injections.

Sulphaemoglobinaemia: Its cause and prevention, with special reference to treatment with sulphanilamide, H. E. Archer and G. Discombe (*Lancet [London], 1937, II, No. 8, pp. 432–435*).—It is pointed out that the condition originally called enterogenous cyanosis, thought to be due to intestinal toxemia, has been shown to be due to the presence of sulfemoglobin or methemoglobin in the blood. A large majority of the cases reported have been associated with prolonged or otherwise excessive ingestion of drugs derived from aniline or nitrobenzene, of which the most important are phenacetin, acetanilide, methylacetanilide, the more recently introduced sulfanilamide, and nitrobenzene itself.

It has been found that "the intracorpuscular sulfemoglobinemia associated with the administration of drugs derived from aniline results from the combination of hemoglobin with the hydrogen sulfide absorbed from the intestinal tract; this reaction is catalyzed by the drug circulating in the blood. The normal absorption of protein digestion products in the small intestine is diminished by purgation, causing increased putrefaction in the colon and a production of hydrogen sulfide much in excess of normal. Saline cathartics are most active in this process because their osmotic action maintains the contents of the colon in a semifluid state, thus accelerating putrefaction. The development of sulfemoglobinemia can be prevented or considerably delayed by keeping the colon free from food residues."

The consumption of chloramine in milk: Bacteriological investigation, H. Hedström (*Skand. Vet. Tidskr., 27 (1937), No. 5, pp. 259–269; Eng. abs., pp. 268, 269*).—Tests of the disinfectant use of chloramine (Sterisol) against mastitis streptococci of the types *Streptococcus schütz* and *S. agalactiae*, emulsified in a physiological saline solution and in milk, are reported. Chloramine in a concentration of 0.2:1,000 (1:5,000) was found to kill mastitis streptococci, emulsified in a physiological saline solution, within 1 hr. Chloramine in a concentration of 2.5:1,000 killed mastitis streptococci emulsified in milk within 1 hr., but the chloramine concentration of 2:1,000 is not sufficient to obtain this disinfecting effect, even if the period of action is extended to 24 hr.

Experimental disinfection with chloramine acting on tubercle bacilli, G. Hülphers (*Skand. Vet. Tidskr., 27 (1937), No. 5, pp. 213–221; Eng. abs., pp. 220, 221*).—The results of experimental disinfection by chloramine of tubercle bacilli in sputa from man and cattle, of secretions from the bovine uterus, and of pure culture of bovine tubercle bacilli are reported upon.

The tubercle bacilli in sputa from man were killed within an hour by 3- and 5-percent solutions of chloramine, in sputa from cattle within 2 hr. by 5-percent solutions, and in secretion from the uterus of cattle within 2 hr. by 3- and 5-percent solutions. A 5-percent solution of chloramine and salt in equal parts

killed tubercle bacilli in uterine secretion from cattle within 1 hr. This did not happen with a 3-percent solution of chloramine and salt in equal parts. In this case the tubercle bacilli still were living after 5 hours' exposure to the disinfectant. In the experiments 1 part sputum from man and from the uterine secretion and 1 part sediment from the bovine sputum were each mixed with 10 parts of chloramine solution.

In the experiments with pure cultures of bovine tubercle bacilli, they were not killed by a 5-percent chloramine solution within 24 hr.

Chemotherapy of streptococcal infections with p-benzylamino-benzenesulphonamide, B. A. Peters and R. V. Havard (*Lancet [London], 1937, I, No. 22, pp. 1273, 1274*).—In reporting upon the results obtained in the administration of Proseptasine (*p*-benzylaminobenzenesulfonamide) for several streptococcal infections, the spread of erysipelas is said to have been arrested in 24 hr. in all of 47 cases. In 31 cases the temperature was normal within 24 hr. and in a further 12 within 48 hr. A similar result was observed in other types of streptococcal infection.

The treatment of streptococcal infections in mice with 4:4′ diaminodiphenylsulphone, G. A. H. Buttle, D. Stephenson, S. Smith, T. Dewing, and G. E. Foster (*Lancet [London], 1937, I, No. 23, pp. 1331–1334*).—The authors found that 4,4-diaminodiphenylsulfone (diaminosulfone) is active in curing streptococcal infections of mice in doses of about one-hundredth of those required with *p*-aminobenzenesulfonamide (sulfanilamide). It is, however, 25 times as toxic. The drug is not more toxic than sulfanilamide in normal rabbits or monkeys, except that it is more active in producing methemoglobinemia in the latter animal. The corresponding dinitro compound (dinitrosulfone) is not so toxic to mice as sulfanilamide and its antistreptococcal activity in mice is not inferior to that of the latter substance.

Allergy: A review of the literature, F. M. Rackemann (*Arch. Int. Med., 57 (1936), No. 1, pp. 184–212; 59 (1937), No. 1, pp. 144–172*).—A review of the literature of 1935 accompanied by a list of 137 references and of 1936 accompanied by 140 references (E. S. R., 74, p. 100).

The chemical constitution and biological activity of the toxic fraction of Brucella cells, I. F. Huddleson and R. Pennell (*2. Internatl. Cong. Microbiol., London, 1936, Rpt. Proc., pp. 428, 429*).—A further contribution (E. S. R., 77, p. 393) on the chemical properties, together with information on the biological properties, of the toxic fraction of *Brucella* cells.

Fifth progress report of the Foot-and-Mouth Disease Research Committee, J. A. Arkwright et al. (*London: Min. Agr. and Fisheries, 1937, pp. 386, pls. 27, figs. 10*).—In this further report (E. S. R., 66, p. 667), research work on (1) characteristics of the foot-and-mouth disease virus, (2) immunity and the determination of types (hyperimmune serum), (3) nutrition of animals in relation to infection, (4) means by which the disease may be introduced into Great Britain, (5) carriers of the disease among farm animals, (6) means by which the disease is spread, (7) infection of small animals and birds, ticks, and the wild fauna, and (8) methods of dealing with foot-and-mouth disease abroad are dealt with (pp. 9–33). The several appendixes (pp. 34–386) consist of (1) a detailed report of work at the Experimental Station at Pirbright, (2) a detailed report of work at the Lister Institute of Preventive Medicine, London, and the Experimental Station at Pirbright, (3) a detailed report of work at the National Institute for Medical Research at Hampstead, (4) a paper by T. Hare on foot-and-mouth disease lesions in the ear epidermis of inoculated guinea pigs, and (5) a report on faunal surveys of foot-and-mouth disease areas undertaken by the Bureau of Animal Population, Oxford University.

Epizootic rabies in domestic animals in Brazil and other countries of South America, and its transmission by vampire bats [trans. title], V. CARNEIRO (*Arch. Inst. Biol. [São Paulo], 7 (1936), pp. 273–322, fig. 1; Eng. abs., pp. 313–319*).—An extended account based upon a review of the literature, to which 78 references are given, and observations conducted by the Biological Institute of São Paulo.

A strain of endemic typhus fever isolated from a field mouse, G. D. BRIGHAM (*Pub. Health Rpts. [U. S.], 52 (1937), No. 21, pp. 659, 660*).—An old-field mouse of the species *Peromyscus polionotus polionotus* trapped on rural premises in the southeastern part of Alabama in the fall of 1936 was found infected with the virus of endemic typhus fever.

Susceptibility of animals to endemic typhus fever, G. D. BRIGHAM (*Pub. Health Rpts. [U. S.], 52 (1937), No. 21, pp. 660–662*).—Reporting further (E. S. R., 75, p. 373), the author found old-field mice, cotton mice, golden mice, cotton rats, rice rats, wood rats, flying squirrels, and cats trapped in Alabama to be susceptible to the virus of endemic typhus fever. Raccoons were not found susceptible.

Manual of human parasitology, D. L. BELDING (*Boston: Author, 1936, 2. ed., pp. 318, figs. 129*).—Section 1 is devoted to general parasitology (pp. 9–89), section 2 to spirochetes (pp. 90–111), section 3 to Protozoa (pp. 112–181), section 4 to Helminthes (pp. 182–264), and section 5 to Arthropoda (pp. 265–307).

[Contributions on animal parasitology] (*Helminthol. Soc. Wash. Proc., 3 (1936), Nos. 1, pp. 16, 22–32, 34–36, figs. 5; 2, pp. 39–52, 56–61, 62, 63–66, figs. 2*).—The contributions presented relating to parasitology (E. S. R., 74, p. 846) include the following:

No. 1.—The Occurrence of the Cestode *Moniezia benedeni* (Anaplocephalidae) in the American Moose [*Alces americanus*], by W. L. Jellison (p. 16); Comparative Morphology and Development of Infective Larvae of Some Horse Strongyles, by J. T. Lucker (pp. 22–25); *Metroliasthes lucida*, a Cestode of Galliform Birds, in Arthropod and Avian Hosts, by M. F. Jones (pp. 26–30); A New Heterophyid Trematode of the Genus *Ascocotyle* (Centrocestinae), by E. W. Price (pp. 31, 32); and A New Trematode, *Laterotrema americana* n. sp. (Stomylotrematidae), From Song Birds (pp. 34, 35) and A New Trematode, *Gyrabascus echinus* n. sp., From the Yellow-Breasted Chat [*Icteria virens*] (pp. 35, 36), both by A. McIntosh.

No. 2.—Observations on the Chemical Nature of the Cuticle of *Ascaris lumbricoides* var. *suis*, by B. G. Chitwood (pp. 39–49); A New Species of Cestode, *Davainea meleagridis* (Davaineidae) From the Turkey, With a Key to Species of *Davainea* From Galliform Birds, by M. F. Jones (pp. 49–52); New Terrestrial and Aquatic Intermediate Hosts for *Brachylaemus virginiana* (Dickerson) Krull (Trematoda: Brachylaemidae) (pp. 56–58) and Additional Second Intermediate Hosts for *Gorgodera amplicava* Looss 1899 (Trematoda: Gorgoderidae (p. 58), both by W. H. Krull; Parasitic Worms of Equines in Panama, by A. O. Foster (pp. 59, 60); Some Observations on the Emission of Cercariae of *Schistosoma mansoni* (Trematoda: Schistosomatidae) From *Australorbis glabratus*, by A. Giovannola (pp. 60, 61); An Abnormal Ovary in *Fasciola hepatica* (Trematoda: Fasciolidae), by W. A. Hoffman (p. 62); On the Assignment of *Echinorhynchus dirus* to the Genus *Acanthocephalus*, by H. J. Van Cleave and L. H. Townsend (p. 63); A Method for Obtaining Adults of *Stephanofilaria stilesi* (Nematoda: Stephanofilariidae) (p. 64) and The Springbuck (*Antidorcas marsupialis*), a New Host of the Lungworm *Bronchonema magna* Mönnig 1932 (Nematoda: Metastrongylidae) (p. 64), both by G. Dikmans; A Method for Recovering the Strongyle Larvae of the Horse, by H. L. Van Volkenberg (p. 65),

and A Note on the Use of Brilliant Green as an Anthelmintic for Chickens, by W. H. Wright and H. L. Van Volkenberg (p. 65), both contributed from the Puerto Rico Experiment Station; and Notes on the Spread, in One Year, of Helminths From Infected to Uninfected Poultry Yards, by M. W. Horsfall (p. 66).

The coccidia of domestic animals in Brazil [trans. title], V. L. [W. L.] YAKIMOFF (*Arch. Inst. Biol.* [*São Paulo*], *7* (*1936*), *pp. 167–187; Eng. abs., pp. 186, 187*).—Studies conducted by the author of the feces of various domestic animals received from the State of São Paulo led to the conclusion that eimeriosis exists in cattle, sheep, pigs, and fowls. The forms identified from these several hosts are considered, their incidence having been as follows: In cattle 24.4 percent, sheep 48.9, pigs 84.9, and in fowls 19.8 percent.

A study of parasite control in Puerto Rico over a period of five and a half years, G. W. BACHMAN, R. RODRÍGUEZ MOLINA, W. A. HOFFMAN, and J. O. GONZÁLEZ (*Puerto Rico Jour. Pub. Health and Trop. Med.*, *12* (*1937*), *No. 4*, *pp. 369–388*, *figs. 10*).—This is a review, presented with a list of 20 references.

Studies of Clostridium chauvoei and its morphological variation [trans. title], C. RODRIGUES (*Arch. Inst. Biol.* [*São Paulo*], *7* (*1936*), *pp. 235–244*, *pls. 7*, *fig. 1; Eng. abs., p. 244*).—The author's observations have shown a large variability in the morphological appearance of colonies formed by different strains of *C. chauvei*.

Stephanofilariasis, VI, VII, F. C. KRANEVELD (*Nederland. Indische Bl. Diergeneesk.*, *47* (*1935*), *Nos. 3–4*, *pp. 183–186*, *Ger.*, *Eng. abs. pp. 185, 186; 6, pp. 310–316*, *pls. 3*, *Ger.*, *Eng. abs. p. 316*).—The occurrence of *Stephanofilaria dedoesi* in cattle and goats (pp. 183–186) and as an ear infection of the buffalo (pp. 310–316) is reported upon (E. S. R., 73, p. 241).

The ticks parasitic on the principal domestic animals in Formosa, Japan, K. OGURA (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ.*, *19* (*1936*), *No. 2*, *pp. 75–85*, *pls. 5*).—In the course of a study of piroplasmosis of cattle in Taiwan (Formosa) during a period of 3 yr., six species of ticks were collected from cattle, water buffaloes, pigs, and dogs in various parts of Taiwan, namely, *Boophilus annulatus* var. *caudatus* (Neum.), the brown dog tick, *Amblyomma testudinarium* Koch, *Haemaphysalis hystricis* Supino, *H. flava* Neum., and *H. formosensis* Neum. Technical descriptions and photographic reproductions of the males and females are here presented.

Immunity in protozoal diseases, H. E. SHORTT (*Indian Sci. Cong. Proc.* [*Calcutta*], *23* (*1936*), *pp. 455–482*).—This contribution, presented as a presidential address at the Twenty-third Indian Science Congress held at Indore in January 1936, is accompanied by a list of 77 references to the literature.

The experimental pathology and pathologic histology produced by the toxin of Vibrion septique in animals, J. G. PASTERNACK and I. A. BENGTSON (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 168* (*1936*), *pp. IV+46*, *pls. 10*).—Following a brief introduction and discussion of the relation of the amount of toxin administered to length of survival of animals and the action of the *V. septique* toxin, the details of its pathology in rabbits, mice, guinea pigs, and pigeons are reported upon at length.

Albuminuria and nephritis in dairy cows, H. J. METZGER, F. E. HULL, and F. ELY (*Kentucky Sta. Bul. 373* (*1937*), *pp. 89–118*, *figs. 6*).—A study made of the occurrence of albuminuria and nephritis in the station dairy herd from October 1930 to April 1937 is reported upon, the details being presented in tables and charts. During this period 103 Jerseys, 45 Holsteins, and 8 Guernseys were under observation.

"Some of the Jerseys showed albuminuria more or less regularly since calfhood, and 13 of them finally developed nephritis. While some animals of the other breeds showed albumin in the urine, it did not appear regularly and they developed no nephritis. The kidneys from these nephritis cases showed a wide variety of lesions and the cultures showed either a colon organism, a nonhemolytic streptococcus, a staphylococcus, or a combination of these organisms. The history of these cases, the variety of lesions found, and the different types of organisms occurring in the urinary tract, all indicate that this nephritis was not caused by a specific infection. The possibility is suggested that we are working with a strain of Jerseys which is susceptible to conditions affecting the urinary tract. A study of the pedigree of these afflicted animals strengthens this argument.

"A favorable report is given regarding the use of cod-liver oil on one case of nephritis."

The incidence of streptococcic infection in the udders of Bang's disease positive and negative cows, H. B. Morrison and F. E. Hull (*Kentucky Sta. Bul. 372 (1937), pp. 77–87*).—It having been shown by several workers that *Brucella abortus* may cause a low-grade or chronic insterstitial mastitis and there being little information available regarding the frequency of streptococcic infection of udders of Bang's disease positive and negative cows, a study was made of the milk from cows in two large commercial dairies, both of which contained positive and negative animals.

Examinations of 710 milk samples drawn aseptically from individual quarters of the udders of the cows maintained in these dairies, made for streptococci and agglutination reaction, are reported, with the details given in tables. Of these samples, 332 were from 87 Bang's disease positive and 378 from 97 Bang's disease negative cows. The distinctly different systems of management used in caring for each herd are described.

"Streptococci were found in milk from 66.7 percent of the Bang's disease positive and 40.2 percent of the negative cows. Of the milk samples, 46.4 percent from the positive and 22.2 percent from the negative cows contained streptococci. The percentage of both cows and samples with streptococci was quite uniform among the Bang's disease positive cows . . . but varied widely among the negative cows. Milk from 66.7 percent of the Bang's disease positive cows and 1 percent of the negative cows showed agglutination. From the positive cows 50.6 percent of the milk samples showed agglutination, while only 0.3 percent of the samples from negative cows were agglutinated. From Bang's disease positive cows having streptococci in their milk from one or more quarters 69.7 percent of the samples showed streptococci, while 55 percent of the samples from a similar group of negative cows contained streptococci. The average number of infected quarters per cow was 2.7 for the positive and 2.1 for the negative cows. Of the streptococcus infected Bang's disease positive cows 53.5 percent had three or more quarters infected, while only 33.3 percent of the negative cows had three or more quarters infected. No relation was found between the presence of streptococci and agglutination in the same sample of milk. Streptococci were found in milk samples from all quarters of the udder about equally, although there were a few more reactions in samples from the right side of the udder. Agglutinations were distributed very evenly in milk samples from the different quarters of the udders. Attention is called to the possibility of Bang's disease positive cows as a source of udder infection of negative cows."

Investigations of Bang's disease in Bernese dairy herds [trans. title], P. Kästli (*Landw. Jahrb. Schweiz, 51 (1937), No. 2, pp. 186–232; Fr. abs., pp.*

231, 232).—An extended report of studies of Bang's disease as found in Bern, Switzerland, and its environs.

Control of Bang's disease by tests and segregation, W. S. CUNNINGHAM and R. N. DAVIS (*Arizona Sta. Bul. 157* (*1937*), *pp. 129–139*).—In the course of work aimed at (1) determination of the extent of Bang's disease in the State and (2) means of control in badly infected herds, 73 of 89 herds tested were found to contain reacting animals. Of the animals included in the first test on each farm, 2,380 in number, 24 percent reacted. Five herds that were selected for an abortion control study were tested at regular intervals, the reactors being segregated from the nonreactors but kept on the same farm. Two herds did not have a new reactor develop after segregation. Two others cleaned up after about 2 years' testing. The reactors of 4 herds were sold as soon as there were enough negative cows to provide sufficient milk for the market. One herd still maintained the positive cows to the end. The findings indicate that it is possible and feasible under Arizona conditions to eradicate Bang's disease from dairy herds by testing and segregating on the same farm. It is pointed out that reactors should be removed as far from the negative cows as practicable. Good fences and careful supervision are necessary in any segregation plan. Purchased cows should be quarantined and retested in 60 days before being allowed contact with the regular herd.

Control of Bang's disease in Missouri, C. ELDER (*Missouri Sta. Bul. 388* (*1937*), *pp. 14, figs. 2*).—The progress made in the control of Bang's disease in Missouri is shown by the compiled data here presented.

Pyrethrin and prophylaxis of pulmonary strongylosis [trans. title], H. VELU and G. ZOTTNER (*Bul. Acad. Vét. France, 10* (*1937*), *No. 1, pp. 53–58*).—Aqueous suspensions of pyrethrin administered nasally to the bovine in a seated position have been found to be given readily without ill effect and effective in the treatment of *Dictyocaulus*.

Some observations on vaginal Trichomonas (T. foetus) and the Trichomonas in the digestive tract of cows in culture, B. M. DAS GUPTA (*Indian Jour. Med. Res., 24* (*1936*), *No. 2, pp. 541–544, figs. 5*).—Report is made upon a study of the trichomonad flagellates from the vagina and cecum of cows for comparative purposes under identical conditions of culture. "The vaginal forms differ from those of the cecum in that they are slender and longer organisms, conspicuous by their possession of a well-developed undulating membrane with about four deep curves, they do not ingest any solid food particles, such as starch, bacteria, yeasts, etc., in marked contrast to the cecal organisms which are voracious feeders. Further the pathogenicity of *T. foetus* has been proved beyond any doubt, while the intestinal forms are apparently harmless as they are present in healthy animals with no lesions in the cecum."

The early history of bovine tuberculosis control work in Pennsylvania, C. J. MARSHALL (*Penn. Univ., Vet. Ext. Quart. No. 65* (*1937*), *pp. 8–11*).—In the course of this account, presented at a gathering on December 16, 1936, in celebration of the Federal accreditment of Pennsylvania, reference is made to the results of the first tuberculin test in the Northern Hemisphere, made in Pennsylvania on March 16 and 17, 1892, and the author's observations of autopsies on some of the 51 reactors in the herd of 79 head. The history of the campaign against bovine tuberculosis in Pennsylvania is divided into three periods: The pioneer period, 1892–96, the Pennsylvania plan, 1896–1919, and the Federal-State accredited plan, 1919–36. Reference is made to the summary of the Pennsylvania plan as presented in 1901 (E. S. R., 13, p. 591).

Classification of Bacterium coli from diseased calves, R. LOVELL (*Jour. Path. and Bact., 44* (*1937*), *No. 1, pp. 125–139, pl. 1*).—The author found that

on using the precipitin test as a method of classification 79 of 110 strains of *B. coli* isolated from calves fell into one or the other of 8 types. It is concluded that special races of *B. coli* pathogenic for young calves exist, but that more than one race may be present in a herd and sometimes more than one type may be isolated from an individual calf.

The treatment of verminous bronchopneumonia of sheep [trans. title], I. DUMITRU (*Ann. Inst. Natl. Zootech. Roumanie, 5 (1936), pp. 114–136, pls. 2, figs. 5*).—An account is given of the successful treatment of verminous bronchopneumonia of sheep through intratrachea injections of a solution consisting of 18 cc of tincture of iodine, 150 cc of glycerine, and sterile water 750 cc. Creosote mixed with the oil of turpentine and alcohol to which, after homogenization, a glycerine solution or simply water is added, injected intratracheally was found to have a strongylicide action and therapeutic effect upon pulmonary strongylosis that is superior to that of tincture of iodine (1.5–2 percent). The dose is from 5 to 10 cc for lambs, 10 cc for rams, and 20 cc for young and adult ewes.

An epizootic of infectious abortion of sheep caused by Salmonella abortus ovis in Rumania [trans. title], I. SUHACI and I. ISOPESCU (*Arh. Vet., 29 (1937), No. 2, pp. 17–27; Ger., Eng. abs., pp. 26, 27*).—During an epizootic in ewes, with a percentage of 13.7 abortions, a Gram-negative organism identified culturally, serologically, and by experimental inoculations as *S. abortus ovis* was isolated. Vaccination by two successive inoculations with anaculture in doses of 1 cc for the first and of 2 cc for the second, 8 days later, gave good results, the cases of abortion having ceased completely after the last inoculation.

The control of sheep parasites, D. W. BAKER (*Cornell Vet., 27 (1937), No. 2, pp. 218–221*).—A short résumé of the information available.

The physiology of the sheep tapeworm, Moniezia expansa Blanchard, R. A. WARDLE (*Canad. Jour. Res., 15 (1937), No. 6, Sect. D, pp. 117–126*).—The author found that sheep tapeworms may live 2 or 3 days in balanced salines, although in the majority of experiments they died in 9 to 12 hr. Addition of glucose abbreviates the longevity period in saline media. The water content is affected only slightly by balanced salines, but is influenced by the concentration of sodium chloride and by the presence of sugars and amino acids; behavior in saline media cannot be correlated wholly with changes in water content. The polysaccharide content is not significantly different from mammalian glycogen, constitutes from 0.35 to 5.25 percent of the fresh weight, remains stable during immersion of the living worm for 6 hr. in media that reduce muscle tonus, but decreases during immersion in media that encourage muscle tonus. Glycogen increase occurs when the medium contains glucose up to 1 percent, but not when the glucose content exceeds this amount or when the glucose is replaced by other sugars, by amino acids, or by glycoproteins. Saline media are adjudged unfavorable to tapeworm existence in vitro.

The effect of oral feeding of the infective larvae of Ostertagia circumcincta (Stadelman 1894) Ransom 1907 upon the normal blood picture of its host, Ovis aries, W. L. THRELKELD and T. O. DOWNING (*Va. Acad. Sci. Proc., 1934, p. 39*).—This is an abstract of a contribution on *O. circumcincta*, which was administered to nine lambs of varying age.

"The doses of larvae employed in experimental infections ranged in number from 5,000 to 1,000,000. The dosage was varied over short and long periods. A departure from the normal blood pictures was obtained in three animals. This was manifested in the total white cell and red cell counts, the changes in the percentage of hemoglobin, and the differential counts. The most positive results were obtained in animals which had received 225,000 and 1,000,000

larvae within a very short period of time (10 days). In these cases there were accompanying symptoms, such as interrupted growth, loss of weight, intermittent constipation, distended abdomen, and general run-down condition."

A census of intestinal parasites of lambs in south Wales, D. W. Fenwick (*Jour. Helminthol., 15 (1937), No. 3, pp. 169–176*).—The census here reported, made in order to supply information on the numbers of different species of parasites in lambs, completes earlier work by Davey on the abomasal parasites of lambs (E. S. R., 76, p. 251). It is based upon material obtained at the Roath Abattoir, Cardiff.

The swine erysipelas bacterium a cause of septicemia in lambs [trans. title], G. Cordier and J. Ménager (*Rec. Méd. Vét., 113 (1937), No. 4, pp. 215–221, figs. 2*).—The authors have found the swine erysipelas organism to be the cause of a septicemia in lambs in Tunis, the infection probably being of umbilical origin. It is pointed out that this bacterium has been reported as affecting many of the domestic animals, including bovines, ovines, and fowl as well as swine. Reference is made to the report by H. Carré[5] of its importance as the cause of a chronic arthritis of lambs in France.

A note on the pathogenicity of the organism of contagious bovine pleuropneumonia for goats, A. T. Dick (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 2, pp. 164–167*).—When goats more than 12 mo. old were injected subcutaneously with broth cultures of the causal organism of pleuropneumonia contagiosa bovum, large inflammatory edematous swellings developed, just as they would under similar circumstances in cattle. The animals showed a thermal response, produced complement-fixing antibodies, and developed an immunity to further injections. When 4-month-old goats were given injections of the same cultures, these swellings did not develop and there was no thermal reaction.

The treatment of equine colic by intravenous injections of formalin [trans. title], M. R. Nicolae (*Arh. Vet., 29 (1937), No. 2, pp. 1–11; Eng., Ger. abs., p. 11*).—The administration intrajugularly of 20 cc of a 40-percent commercial solution of formalin diluted with water 1 part to 10 in the treatment of colic in horses in 1934 and 1935 was found to give good results. When the sedative effect is not manifested after 15 min., a second injection of 10 or 20 cc must be administered.

Dourine in South Africa, K. C. A. Schultz and J. J. C. Keppel (*Farming in So. Africa, 12 (1937), No. 130, pp. 35, 44, figs. 3*).—A discussion of this disease which is said to occur in South Africa in the western portion of the Orange Free State, Griqualand West, Bechuanaland, South-West Africa, and in the Bredasdorp and Worcester divisions of the western Cape of Good Hope.

On the value of various chemical substances as a means of destroying infective larvae of horse sclerostomes in the field, J. W. G. Leiper (*Jour. Helminthol., 15 (1937), No. 3, pp. 153–166*).—In the experiments reported hypochlorite was found to be of no practical value for field and stable use against infective larvae of sclerostomes. Preliminary investigations on the use of calcium cyanamide on heavily infected grass plats show that approximately 70 percent of the sclerostome larvae in the grass and 47 percent in the undergrowth are destroyed by an application of 7 cwt. per acre during February without any permanent damage to the grass.

On Weil's disease in dogs and foxes, S. Rubarth (*Skand. Vet. Tidskr., 27 (1937), No. 6, pp. 285–306, figs. 4; Ger., Eng. abs., pp. 302, 303*).—Weil's disease in Sweden seems mostly to occur sporadically and has at times assumed an

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[5] Rev. Gén. Méd. Vét., 40 (1931), No. 470, pp. 69–77.
Bul. Acad. Vét. France, 5 (1932), No. 7, pp. 301–307, figs. 2.

enzootic character in both dogs and foxes. On a fox farm of some 30 animals approximately one-half were affected within the course of a few days.

In dogs, the author's material includes Weil cases both with and without icterus. Of the latter type there occur examples of both a peracute hemorrhagic form and a uremic one (so-called Stuttgart disease of dogs).

Paratyphus in foxes, G. Wramby (*Skand. Vet. Tidskr., 27 (1937), No. 5, pp. 222–247; Eng. abs., pp. 245, 246*).—Report is made of a study conducted in Sweden during the summer of 1936, when paratyphus was enzootic and occasioned great losses (89.1 percent of affected foxes) on a large number of fox-breeding farms. On 15 of the 22 farms reported upon, paratyphus organisms (Gärtner (group D) type *Salmonella enteritidis* var. *dublin*) were found to be the cause. On 3 fox-breeding farms *S. cholerae suis* was the causative organism. Serum treatment proved to be of little or no value. Administration of specific bacterin, in doses of 1 cc, gave good results, the mortality being reduced to from 2 to 4 percent.

"As a suitable treatment against paratyphus in foxes there is proposed the avoidance of meat food which displays signs of being tainted; bacterin treatment with specific bacterin; hygienic measures; the extermination of rats; and the discovery, by means of bacteriological investigation, of possible chronical carriers among the foxes and isolation of such animals."

[Work with poultry diseases by the North Carolina Station] (*North Carolina Sta. Rpt. 1934, pp. 55–57*).—Reference is made to investigations (E. S. R., 74, p. 99) of septicemic diseases among fowls in the State (E. S. R., 77, p. 548); serological studies on adult carriers of pullorum disease; and normal and pathological hematology of the fowl, already noted (E. S. R., 75, p. 109).

Doyle's disease of fowls: Its diagnosis and control, L. Sahai (*Agr. and Livestock in India, 7 (1937), No. 1, pp. 11–17*).—A practical summary of information, based upon recent investigations by the author, on Doyle's disease (E. S. R., 66, p. 371), formerly known as Ranikhet disease and Newcastle disease. This is perhaps the most common disease of fowls in Bihar and Orissa Provinces.

A description of a highly fatal virus disease of poultry new to east Africa, J. R. Hudson (*East African Agr. Jour., 2 (1937), No. 6, pp. 495–497*).—An account is given of an outbreak of a disease of fowls in Kenya Colony, the symptoms and post-mortem findings of which agree with those of the so-called Newcastle disease.

The etiology of fowl paralysis, leukemia, and allied conditions in animals, IX, X, M. W. Emmel (*Florida Sta. Bul. 313 (1937), pp. 24, figs. 2*).—This continuation of the studies noted (E. S. R., 77, p. 546) gives the results of experiments in which attempts were made to ascertain the respective ability of *Salmonella enteritidis* and of *S. schottmülleri* to induce the various pathologic manifestations of this group of diseases in the chicken.

In the experiment reported in part 9 (pp. 5–16), *S. enteritidis* was administered by an intrayolk sac injection, a repeated intravenous injection, and an oral exposure of parasite-free birds and through oral exposure to *S. enteritidis* of birds naturally and artificially parasitized to *Eimeria*, *Ascaridia*, and *Taenia*.

It was found that the organism induced a septicemic disease when a suspension of 0.1 cc was injected into the yolk sac of 20 day-old Barred Rock chicks. "Twenty 3-week-old Barred Rock chicks exposed to *S. enteritidis* in the drinking water for 1 day developed hemocytoblastosis; fowl paralysis and erythroleucosis each occurred in 1 bird after an incubation period 15 and 45 days, respectively. The daily exposure for 30 days of 20 10-week-old parasite-free White Leghorn chickens to *S. enteritidis* in the drinking water and 19 birds of similar age and breed for a period of 60 days resulted in the development of hemocytoblastosis

but none of the other pathologic manifestations. The repeated intravenous injection of suspensions of *S. enteritidis* into 100 parasite-free birds 6 to 20 weeks of age resulted in the development of one of the pathologic manifestations in 57 birds; hemocytoblastosis with recovery occurred in the remaining 43 birds.

"Ninety-six of 175 birds of four breeds affected with artificial or natural *Eimeria*, *Ascaridia*, or *Taenia* infestation developed one of the pathologic manifestations following oral exposure to *S. enteritidis*. Fowl paralysis occurred in 46 birds, lymphomatosis in 27, myeloid leukemia in 13, erythroleucosis, 'light' and anemia, fowl paralysis, and leukemia each occurred in 2 birds, fowl paralysis and lymphomatosis in 3 birds, while anemia occurred in 1. The incubation period for fowl paralysis was from 15 to 66 days, lymphomatosis from 25 to 82 days, myeloid leukemia from 78 to 137 days, erythroleucosis from 64 to 81 days, light and anemia from 23 to 27 days, and anemia 15 days.

"*S. enteritidis* is a causal micro-organism for fowl paralysis, leukemia, and allied conditions in chickens. Two strains of *S. enteritidis* of avian origin and two of human origin did not materially differ in their ability to induce the various pathologic manifestations. The ability of *S. enteritidis* to induce this group of diseases compared most favorably with the more pathogenic strains of *S. aertrycke*."

In part 10 (pp. 17–24) experiments with *S. schottmülleri* similar to those with *S. enteritidis* are reported. "The intrayolk sac injection of 0.1 cc of a suspension of *S. schottmülleri* into day-old Buff Orpington chicks induced a septicemic disease. Twenty 1-week-old Buff Orpington chicks exposed to *S. schottmülleri* in the drinking water for 1 day developed hemocytoblastosis; 1 chick developed anemia in 10 days; 4 died of septicemia in 4 days. The oral exposure of 20 3-week-old Buff Orpington chicks to *S. schottmülleri* in the drinking water for 2 days resulted in the development of fowl paralysis in 1 bird in 22 days and anemia in another in 19 days; the remainder developed hemocytoblastosis and recovered. The daily exposure of 20 11-week-old parasite-free Rhode Island Red chickens to *S. schottmülleri* in the drinking water for 30 days and of 20 birds of similar age and breed for 90 days resulted in the development of hemocytoblastosis, but none of the other pathologic manifestations. The repeated intravenous injection of suspensions of *S. schottmülleri* into 95 parasite-free birds 8 to 16 weeks of age resulted in the development of one of the pathologic manifestations in 37 birds; hemocytoblastosis alone with subsequent recovery occurred in the remaining 58 birds.

"Eighty-four of 195 birds of three breeds affected with artificial or natural *Eimeria*, *Ascaridia*, or *Taenia* infestation developed one of the pathologic manifestations following oral exposure to *S. schottmülleri*. Fowl paralysis occurred in 34 birds, lymphomatosis in 26, myeloid leukemia in 13, erythroleucosis in 3, anemia, light and anemia, fowl paralysis and leukemia, and fowl paralysis and lymphomatosis each occurred in 2 birds. The incubation period for fowl paralysis was 16 to 60 days, lymphomatosis from 29 to 67 days, myeloid leukemia from 82 to 137 days, erythroleucosis from 70 to 101 days, anemia from 19 to 20 days, and light and anemia from 17 to 22 days.

"*S. schottmülleri* is a causal micro-organism for fowl paralysis, leukemia, and allied conditions in the chicken. Four human strains of *S. schottmülleri* induced the various pathological manifestations but with less ability to do so than the two avian strains. The ability of *S. schottmülleri* to induce this group of diseases was not as great as in the instance of *S. aertrycke* and *S. enteritidis* under similar conditions."

A study of leukemia and allied diseases with particular reference to leukemia of chickens and its relation to tumors, E. L. Stubbs (*Penn. Univ.*,

Vet. Ext. Quart. No. 65 (1937), pp. 3–7, figs. 2).—The finding in the course of a study of leukemia of chickens of an organism that could readily be transferred from fowl to fowl (E. S. R., 65, p. 381) led to work with a strain that has been carried in series for 6 yr., particularly as to the nature of its etiology. "Four young healthy chickens were injected with the blood from a leukemia chicken. Two of the four developed in addition to leukemia a tumor at the site of injection. The point of injection was in the wing vein, and the tumor appeared over this site. Transfers from a chicken with this tumor were made and have been continued in series. Some chickens show leukemia, some show tumor, others show a combination of leukemia and tumors . . . . After the intravenous injection of blood procured from chickens known to have this type of tumor or with finely minced tumor extract in Ringer's solution, internal tumor formation frequently follows, appearing as hematomalike formations, most commonly found in the liver, spleen, bone marrow, and gonads, and less frequently in the ovary, kidney, and heart. Fatal hemorrhages from the liver or spleen seem to be the most frequent cause of death."

A histopathological examination is reported upon, and the passages of this tumor and the results of successive intramuscular injections are shown by accompanying figures.

The etiology and histogenesis of leucosis and lymphomatosis of fowls, E. P. Johnson (*Va. Acad. Sci. Proc., 1934, p. 63*).—This is an abstract of a contribution on leucosis and lymphomatosis of fowls, earlier studies of which at the Virginia Experiment Station have been noted (E. S. R., 67, p. 747; 70, p. 101; 71, p. 704; 76, p. 107; 78, p. 109).

Neoplastic diseases in poultry, C. Jackson (*Jour. So. African Vet. Med. Assoc., 7 (1936), No. 3, pp. 69–85*).—In this review it is pointed out that while neoplasia of domesticated mammals cannot be regarded as of general economic importance, in domesticated birds the incidence is high and tumors and tumorlike diseases constitute so common a cause of mortality as to demand serious consideration from an economic standpoint.

Appearance of pullorum infection in flocks previously negative, H. Van Roekel (*New England Poultryman and Northeast. Breeder, 24 (1937), No. 2, p. 31*).—This contribution from the Massachusetts Experiment Station deals with the reappearance of pullorum disease in flocks.

Worm diseases of poultry in India and their control, G. D. Bhalero (*Agr. and Livestock in India, 6 (1936), No. 1, pp. 48–53*).—A practical summary of knowledge of the worm parasites of poultry in India, including symptoms, treatment, and means of prevention.

Studies on the biology and control of the large roundworm of fowls, Ascaridia galli (Schrank 1788) Freeborn 1923, I–VII, F. H. S. Roberts (*Queensland Agr. Jour., 46 (1936), Nos. 1, pp. 38–50; 2, pp. 173–191, figs. 23; 3, pp. 328–356, figs. 7; 4, pp. 468–479, fig. 1; 5, pp. 586–601; 6, pp. 729–746, figs. 4; 47 (1937), No. 1, pp. 8–16*).—In part 1 (pp. 38–50), following a brief introduction with references to the literature and a discussion of the prevalence and distribution and the economic importance of *A. galli* in Queensland, the author reports upon studies of the preparasitic phase (pp. 40–50). Part 2 deals with the parasitic phases in the life cycle of *A. galli* (pp. 173–191); part 3, the pathogenicity of infestation with *A. galli* (pp. 328–356); part 4, the resistance of the chicken to infestation with *A. galli* (pp. 468–479); parts 5 and 6, the control of *A. galli* (pp. 586–601; 729–746); and part 7 with prophylaxis (pp. 8–12).

A list is given of 101 references to the literature (pp. 12–16).

The experimental infection of pigeons and poultry with Ascaridia and Heterakis, M. J. Miller (*Canad. Jour. Res., 15 (1937), No. 5, Sect. D, pp. 105–110, figs. 2*).—Investigations on the intertransmission of pigeon and fowl parasites have shown that *H. gallinae* and *A. galli* from the fowl are not transmissible to pigeons. Larval *A. columbae*, however, will develop in young chicks to a 96-hr. stage, although they are not present 120 hr. after infection.

Prevention and control of intestinal trichomoniasis in turkeys, W. R. Hinshaw (*Nulaid News, 15 (1937), No. 1, pp. 9, 18*).—In considering the trichomonad enteritis of turkeys in California, suggestions are given for its prevention and cure, based upon experience with the disease in that State since 1933.

Diseases of upland game birds, J. E. Shillinger and L. C. Morley (*U. S. Dept. Agr., Farmers' Bul. 1781 (1937), pp. II+34, figs. 8*).—A practical account is given of the diseases and parasites of upland game birds, with a view to assisting organizations and individuals concerned with the management of such fowl.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 110, 219–242, figs. 5*).—The progress results are briefly presented of investigations by C. W. Crawford, E. T. Robbins, and W. M. Dawson on the mechanical measurement of the pulling ability of horses; on the use of electricity on farms, by E. W. Lehmann and A. L. Young; farm sewage disposal, by Lehmann and A. M. Buswell; tractor fuels and use of high-compression tractor engines, both by R. I. Shawl; covering devices on plows, by Young, Shawl, and T. Cleaver; soil erosion control, by Lehmann and R. C. Hay; use of the small combine, by Young, Shawl, W. M. Hurst, W. R. Humphries, and Cleaver; development of machinery for artichoke culture, by Lehmann and Shawl; hay and grain drying, by Lehmann, R. H. Reed, W. L. Burlison, and G. H. Dungan; stationary spraying-plant design, by Lehmann, Reed, H. W. Anderson, and R. L. McMunn; development of apple-washing machinery, by Reed; and development of farm-waste gas plants, by Buswell, Lehmann, and E. E. DeTurk.

[Agricultural engineering investigations by the Missouri Station], J. C. Wooley, M. M. Jones, G. W. Giles, and P. Doll (*Missouri Sta. Bul. 387 (1937), pp. 17, 18*).—The progress results are briefly presented of investigations on the efficiency of tillage methods for growing corn and on the housing of laying hens.

Ground water in Avra-Altar Valley, Arizona, D. A. Andrews (*U. S. Geol. Survey, Water-Supply Paper 796–E (1937), pp. II+163–180, pls. 4, fig. 1*).—This report relates to the geography, geology, ground-water conditions, ground-water developments, and quality of ground water of an area in Pima County, southeastern Arizona, of nearly 1,400 sq. miles.

The demands for water in the area are almost wholly for domestic needs and stock, with only limited uses for irrigation. Water in moderate amounts is obtained from wells in the lower alluvial lands at depths of about 150 to 350 ft. A few wells on the higher alluvial slopes have been drilled to the water table at 550 to 800 ft. In some parts of the pediment zone small amounts of water are obtained at depths of about 20 to 100 ft. in disintegrated rock. In most places the ground water is of good quality, but in a few places in the pediment zone where sandstone and shale of Cretaceous age are penetrated the water is hard and contains undesirable quantities of soluble salts.

Effect of soil moisture characteristics on irrigation requirements, N. E. Edlefsen (*Agr. Engin., 18 (1937), No. 6, pp. 247–250, fig. 1*).—A survey by the California Exprimeut Station shows that the soils of the Paradise Irrigation District will hold only a very narrow range of moisture that is available to plants, although their field capacity is comparatively high. This makes irrigation more frequent than is necessary on most soils of similar texture, and the rate of use of water for a crop of given age may be expected to be higher. In the case of potatoes this condition is aggravated because the nature of the soil is such that the active roots seem to be confined to the surface foot. The survey shows that 18 in. of irrigation water per season is necessary in this district to produce a crop of either apples or potatoes.

The survey shows the influence of the root zone on water requirement of crops and the need for a knowledge of soil moisture characteristics in making an estimate of the irrigation requirements in a particular location.

[**Soil erosion investigations by the North Carolina Station**], F. O. Bartel (*North Carolina Sta. Rpt. 1934, pp. 15–26*).—The progress results are briefly reported of soil erosion research at the station, with a summary of engineering experiments in soil erosion control. These relate to spacing for short graded terraces on steep slopes, spacing of graded terraces on moderate slopes, grades for short terraces, effect of spacing upon long variable graded terraces, grades for long terraces, length of terraces with uniform grades, spacing for short level terraces on steep land, possibility of retaining all of the rainfall on terraced land, benefits derived from terracing, cost of terrace construction, design of farm machinery for operation on terraced land, use of check dams, run-off losses from terraced and unterraced watersheds, and erosion control in terrace outlets.

The permeability of woods to liquids and factors affecting the rate of flow, H. D. Erickson, H. Schmitz, and R. A. Gortner (*Minnesota Sta. Tech. Bul. 122 (1937), pp. 42, fig. 1*).—Studies are reported on the longitudinal permeability of a number of species of wood which has been determined on both the heartwood and sapwood in the seasoned and unseasoned conditions. The effect on permeability of duration of continuous flow, seasoning, and various liquids was also studied, and the comparative permeability of heartwood, sapwood, springwood, and summerwood was found for several species.

In general, the rate of flow of liquid through wood decreased with continued flow and approached equilibrium after about 3 hr., depending upon the kind of wood. The decrease in flow with time was generally considerably greater with water than with zinc chloride solution or commercial benzene.

The ratio of the sapwood to heartwood permeability varied for each of the three species tested. The ratios for a given species differed, usually depending on the liquid used and to some extent on the seasoning treatment. On the basis of increasing ratio of sapwood to heartwood permeability, the order was paper birch, western hemlock, and coast Douglas fir. The comparative permeability of sapwood to heartwood is probably very different for the various species.

The change in the permeability of sapwoods caused by seasoning varied with the kind of wood. With a few exceptions, no great change occurred with seasoning. Seasoned heartwoods were generally about as permeable as the unseasoned. Either pit aspiration does not occur as extensively and intensively as reported in the literature or else it does not greatly influence longitudinal permeability.

The kind of liquid used very definitely affected the equilibrium rate of flow in practically all of the woods. The order of increased flow was water $<$ zinc chloride solution $<$ benzene. The initial rates of flow of the liquids also differed under certain conditions and with various woods.

The character of a liquid may so affect the permeability that the viscosity factor may be completely obscured. There is evidence that electrokinetic effects and polarity of the liquid affect the flow of liquids through wood. Successive changes of water and zinc chloride solutions forced through one kind of wood were accompanied by definite differences in the trend of the rate of flow. Apparently the pore size of the wood membrane was not permanently affected by the salt.

Woods differ in their permeability to a given liquid both in the magnitude of flow and in the extent of the decrease in the rate of flow with time. Springwood was considerably more permeable longitudinally to water than the summerwood in the seasoned and unseasoned sapwoods of two southern pines. Under the conditions of the experiment, resin ducts apparently did not assist the flow of water through the sections.

The unseasoned sapwoods of the species studied have a limited range of permeability. The majority fall within a spread of about 100 percent. The unseasoned heartwoods exhibited a wider range of permeability and less uniformity, as a group and individually, than did the sapwoods.

The orders of arrangement of the woods based on final rates of flow are given. With unseasoned sapwoods the orders are about the same for both water and zinc chloride solution. The orders of arrangement of seasoned sapwoods are shifted somewhat from that of the unseasoned sapwoods, but are not greatly different for the three liquids. The orders of arrangement of the heartwoods are essentially alike for the three liquids used and for the seasoned and unseasoned sections.

A list of 34 references to literature bearing on the subject is included.

Public Roads, [October 1937] (*U. S. Dept. Agr., Public Roads, 18 (1937), No. 8, pp. [2]+149–168+[2], figs. 14*).—This number of this periodical contains the current status of various highway projects receiving Federal funds as of September 30, 1937, and an article entitled Distribution of Wheel Loads and Design of Reinforced Concrete Bridge Floor Slabs, by H. R. Erps, A. L. Googins, and J. L. Parker (pp. 149–167).

A study of the operation of tractors and implements under farm conditions, H. E. MURDOCK (*Montana Sta. Bul. 344 (1937), pp. 102, figs. 92*).—The results of studies over the past 7 yr. relating to the mechanical factors involved in the operation of tractors and implements are summarized. The results show that under Montana conditions implements should be operated as deep as is necessary to do a good job of weed killing but no deeper. Tractors operate most efficiently near their rated capacity. For economy, therefore, they should always be loaded up to nearly a full load. Light draft implements should be hitched in gangs of two or more to make an economical load for the tractor. By matching the load to the tractor the best speed for the operation may be used. If the draft is too light, a speed too high for the implements may be necessary to get efficient use of the power, whereas, if the draft is too great it may cause excessive slip with too slow speed. It is important that the proper carburetor adjustment be maintained. Excessive use of fuel may result from improper setting of the valves that regulate the ratio of fuel to air.

Results of field studies of small combines, W. M. HURST and W. R. HUMPHRIES (*Agr. Engin., 18 (1937), No. 6, pp. 265–267, figs. 3*).—Field studies conducted by the U. S. D. A. Bureau of Agricultural Engineering are briefly reported.

In harvesting wheat and oats, threshing losses—grain thrown out with the straw and chaff—were somewhat lower for the 5- and 6-ft. combines than for those of 8-ft. and larger sizes. Cutter bar losses, on the other hand, were slightly higher for the small machine, with very little difference in total losses

for the two size groups. Available information shows no significant difference in the quality of small grain harvested with the small and larger sizes.

In harvesting soybeans the 5- and 6-ft. combines also gave slightly lower threshing losses but somewhat higher cutter bar losses than the 8-ft. and larger sizes. In 1935 in Illinois, the total loss was less for the small machine but the reverse was true in 1936. In the South, with a limited number of tests, the quality of the beans obtained (U. S. grade) with 5- and 6-ft. combines was slightly higher than with larger machines. In Illinois the reverse was true, due doubtless to difference in machine adjustments for the two areas. The quality of beans obtained with a combine, especially with reference to splits, depends to a large extent upon cylinder speed and concave adjustment. Ample evidence is available to indicate that with proper adjustments a No. 1 or No. 2 grade of beans can be obtained with any size combine in good mechanical condition, provided the beans are not damaged prior to harvest.

The threshing unit in all sizes of combines tested appeared more effective in wheat and oats than the separator, as much more threshed grain was thrown over with the straw and chaff than unthreshed heads.

Small power take-off combines mounted on rubber tires are usually pulled at a speed of from 0.5 to 1.0 m. p. h. faster than machines equipped with an auxiliary engine and steel tires. Under favorable crop and field conditions the 5- and 6-ft. machines will usually give satisfactory results when pulled at 5 m. p. h., which is approximately twice as fast as the average speed of other sizes.

A device to assist in mowing kudzu, E. G. DISEKER (*Alabama Sta. Leaflet 16 (1937), pp. 4, figs. 5*).—An attachment to a standard mower is described and illustrated, the purpose of which is to assist in cutting the long, tough vines of the kudzu plant.

Drying seed corn with electricity, F. W. DUFFEE (*Agr. Engin., 18 (1937), No. 4, pp. 149–151, figs. 5*).—A description is given of equipment developed at the Wisconsin Experiment Station for the drying of seed corn, using electricity as the source of power. The method involved in this equipment is intended for use by those who make a business of producing seed corn. The usual plan is to install rows of bins on each side of a central air duct, which is divided horizontally through the middle, giving an upper duct and a lower duct. The bins, which are usually 10 ft. deep, have slatted floors approximately 1 ft. above the tight floor. The corn is filled in on top of the slatted floor from 7 to 8 ft. deep. Suitable air ports serve to connect the space underneath the slatted floor with the lower air duct and the free space above the corn with the upper air duct. Every 12-hr. period the flow of air through the corn is reversed by means of a simple valve between the fan and the air ducts. This reversal of the air flow is quite important in securing uniform drying.

A flow of 60 cu. ft. per minute of air for each square foot of bin area is specified at a static pressure of 1 in. of water if the corn is 7 ft. deep in the bin, and 1¼ in. of static pressure if the corn is 8 ft. deep, the static pressure measured a few feet from the discharge of the fan. This quantity of air gives a velocity sufficient to produce strong circulation around all of the ears and apparently in between the kernels as drying progresses, and sufficient to remove moisture films from the kernels so as to produce rapid drying. Any very appreciable reduction in the volume of air will result in considerable reduction in the rate of drying. The air entering the air duct of the drier should not exceed a temperature of 112° F.

The total operating cost has been found to vary from 5 to 15 ct. per bushel, exclusive of overhead, for which with an original investment of from 50 ct. to $1 per bushel of capacity it seems fair to charge about 5 to 10 ct. per bushel.

Chopped hay storage in ventilated containers, S. A. Witzel (*Agr. Engin., 18 (1937), No. 6, pp. 251, 252*).—This brief report of studies in progress at the Wisconsin Experiment Station indicates on the basis of the data secured to date that the major factor determining the temperature and keeping qualities of hay stored in ventilated bins is the density or length of cut. The longer cut keeps better and does not heat as much as shorter cuts. Width of the storage unit is not a very important factor. The differences in the keeping qualities and temperatures between a 3- and a 9-ft. box are not extremely marked, although definitely measureable, but will probably be a controlling factor, along with density, in the elimination of danger of spontaneous combustion in the storing of hay that is too damp.

The nature of the ventilation wall is apparently not extremely important. In a few comparisons of tight walls, slatted walls with about 30 percent of the surface open, and walls lined with netting with fully 90 percent of the surface is exposed to the ventilating flues, no appreciable difference was noted between the slatted walls and the netting walls. If the hay is of rather high moisture content, say 30 percent, and a tight wall is used, when the hay heats, causing moisture to be liberated at a rather high temperature, the moisture moves to the outside of the hay mass, comes in contact with the tight wall, which of course is cooler, and condenses there. The moisture content of the hay next to the wall is thereby increased, and mold, or even rotting, will occur. The wall design should be such as to permit dissipation of this moisture. It also seems likely that a type of wall should be used that will keep down condensation as much as possible.

AGRICULTURAL ECONOMICS

[Papers presented at the twenty-seventh annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 19 (1937), Nos. 1, pp. 400, figs. 5; 2, pp. 401–635, figs. 7*).—Included are the following papers with discussions thereon, abstracts, etc., presented at the annual meeting held at Chicago, Ill., December 28–30, 1936:

No. 1.—Agricultural Conservation—an Aspect of Land Utilization, by M. L. Wilson (pp. 3–12); Economic Implications of the Agricultural Conservation Program, by F. F. Elliott (pp. 13–27); An Appraisal of Aspects of the Transition Program for Agriculture, by M. R. Benedict (pp. 28–40), with discussions by W. C. Lowdermilk (pp. 40–45) and J. A. Hopkins (pp. 45–47); The Federal Land Banks and Agricultural Stability, by J. K. Galbraith (pp. 48–58), with discussion by F. F. Hill (pp. 58–65); Farm Mortgage Investments of Insurance Companies, by S. F. Westbrook (pp. 66–80); Important Issues in Future Farm Credit Administration Policy, by W. I. Myers (pp. 81–92), with discussion by N. A. Olsen (pp. 92–95); The Broadening Field of Agricultural Economics, by M. Ezekiel (pp. 96–101); Land Tenure Research in a National Land Policy, by J. G. Maddox (pp. 102–111); Tenure Problems and Research Needs in the Middle West, by R. Schickele (pp. 112–127); Tenure Problems and Research Needs in the South, by C. A. Wiley (pp. 128–139), with discussions by L. Nelson (pp. 139–141), O. G. Lloyd (pp. 142, 143), and T. L. Smith (pp. 143–147); Observations on Land Value Trends, by B. R. Stauber (pp. 148–160); Appraisal Theory and Practice, by D. H. Doane (pp. 161–168), with discussions by C. H. Hammar (pp. 168–171) and G. S. Wehrwein (pp. 171, 172); Land Valuation in Germany, by K. Brandt (pp. 173–187), with discussion by C. L. Stewart (pp. 187–189); An Appraisal of Resettlement, by G. S. Wehrwein (pp. 190–202), with discussion by C. H. Hammar (pp. 202–205); Experience of Resettlement Administration Program in Lake States, by R. I. Nowell (pp. 206–220), with discussion by W. D. Nicholls (pp. 220–223); Interregional Competi-

tion and Comparative Advantage in Agriculture, by S. E. Johnson (pp. 224–238), with discussion by W. C. Waite (pp. 238–240); Is It Practical to Plan Farm Operations on Agricultural Forecasts? by M. L. Mosher (pp. 241–251), with discussion by W. E. Grimes (pp. 251, 252); Canadian Agricultural Policy—Some Selected Lessons, by H. C. Grant (pp. 253–263); British Agricultural Policy—Some Selected Lessons, by L. A. Wheeler (pp. 264–271), with discussion by H. G. L. Strange (pp. 271–279); Soviet Agricultural Policy—Some Selected Lessons, by L. Volin (pp. 280–286); German Agricultural Policy—Some Selected Lessons, by K. Brandt (pp. 287–299); Past and Present Theory Regarding Futures Trading, by G. W. Hoffman (pp. 300–309), with discussion by H. Working (pp. 309–312); Objectives of Federal Regulations of the Commodity Exchanges, by J. M. Mehl (pp. 313–318), with discussion by L. S. Tenney (pp. 318–320); Essentials of an Effective Futures Market, by A. F. Lindley (pp. 321–330), with discussion by H. S. Irwin (pp. 331–333); New Developments in Agricultural Economics Extension Work, by H. M. Dixon (pp. 334–344), with discussion by L. G. Allbaugh (pp. 344–346); and Use and Possibilities of the County Agricultural Planning Project in Ohio in Developing Programs and Policies, by G. W. Miller (pp. 347–356), with discussion by R. M. Turner (pp. 356, 357).

The reports of officers and committees of the association and notes on Migration of Population and the Flow of Farm Wealth, by F. R. Yoder (pp. 358, 359), and The Response of Kansas Farmers to the Wheat Adjustment Program, by M. L. Robinson (pp. 359–362), are also included.

No. 2.—The Appraisal of Farm Lands, by P. L. Gaddis (pp. 401–415); Using Economic Information in Building an Annual Farm Program, by C. E. Brehm (pp. 416–422), with discussion by F. A. Harper (pp. 422–424); Operating Procedure and Problems Under Section 32 [of Amendments Approved August 24, 1935, to the Agricultural Adjustment Act], by J. W. Tapp and F. R. Wilcox (pp. 425–440); Commodity Surplus Diversion and Agricultural Adjustment, by B. H. Hibbard (pp. 441–451), with discussion by E. A. Duddy (pp. 451–453); Selection of Areas for Sample Agricultural Enumerations.—I, How the Statistics Most Needed Could be Secured, by J. B. Shepard, and II, Tests of Various Sampling Methods, by H. H. Schutz (pp. 454–467), with discussion by Z. R. Pettet (pp. 467–469); What Type of Farm Management, Individual, Professional, or Institutional? by D. W. Trick (pp. 470–478); and 3 papers noted on page 267. Abstracts of papers included are (1) by J. B. Davidson of papers by E. L. Langsford on Mule v. Tractor Power on Plantations (pp. 479–483), by W. M. Hurst on New Types of Farm Equipment and Economic Implications (pp. 483–487), and by J. A. Hodges on The Power Problem in Relation to the Farm Business (pp. 487–492), with discussion by L. J. Fletcher (pp. 492, 493); (2) by L. Spencer of papers by C. G. McBride on Possibilities and Limitations of Public Control in Milk Marketing (pp. 494–496), by J. M. Tinley on Plant Operating Efficiency in the Market Milk Industry (pp. 496–500), by T. K. Cowden on The Supply and Utilization of Milk in Pennsylvania (pp. 501–505), and by W. P. Mortenson on Competitive Market Forces and Their Effect Upon Fluid Milk Consumption (pp. 505–507); (3) by G. W. Forster of papers by J. S. Hathcock on The Past, Present, and Future of Cooperative Cotton Marketing (pp. 520–534), and by J. G. Knapp on The Future of Cooperative Purchasing of Farm Supplies in the South (pp. 534–539); (4) by W. G. Murray of papers by L. J. Norton, E. C. Johnson, and C. R. Arnold on Production Credit (pp. 540–552); (5) by H. M. Haag of papers by R. R. Renne on Research in Measuring the Efficiency of Local Governments (pp. 553–557), and by D. Jackson on The Farm Real Estate Tax Series of the Bureau of Agricultural Economics (pp. 557–568), with discussions by W. L. Bradshaw and H. R. Moore

(pp. 568–571); (6) by J. A. Becker of papers by R. L. Gillett on Problems and Progress in Dairy Statistics (pp. 572–578), and by S. A. Jones on Statistics of Poultry and Egg Production (pp. 578–585), with discussion by S. W. Russell (pp. 585–587); and (7) by G. E. Young of papers by C. C. Taylor on The Social Aspects of Land Adjustment Problems (pp. 588–594), and by E. H. Wiecking on Application of Research to Action Programs (pp. 594–602), with discussions by J. B. Kohlmeyer, C. A. Wiley, L. H. Hauter, G. Wehrwein, C. E. Lively, G. F. Warren, and R. E. Willard (pp. 602–604).

A summarization, by A. F. Vass and O. V. Wells, of the ronnd table discussion on The Influence of the Soil Conservation Program on Regional Livestock Adjustments (pp. 508–519) is also included.

Proceedings of the Fourth International Conference of Agricultural Economists, held at St. Andrews, Scotland, 30 August to 6 September, 1936 (*London: Oxford Univ. Press, 1937, pp. XIV+528, [pls. 2], figs. [34]*).—Included are the following papers (with discussions): The Relations of Agriculture to Industry and the Community, by W. R. Scott (pp. 24–32); The Relations of Land Tenure to the Economic and Social Development of Agriculture, by M. Sering (pp. 73–86) and A. W. Ashby (pp. 87–103): The Provision of Agricultural Credit—Farm Credit in the United States, by F. F. Hill (pp. 127–143), A Sound Basis for Farm Mortgage Credit, by E. H. Thomson (pp. 144–158), Experience of Debt Adjustment in Czechoslovakia, by E. Patka (pp. 159–163), and Some Problems of the Production Credit System, by A. L. Deering (pp. 164–171); Commercial Policy and the Outlook for International Trade in Agricultural Products, by A. Cairns (pp. 176–183); Farm Organization With Special Reference to the Needs of Technical, Industrial, and Economic Development of Agriculture, by A. Bridges (pp. 204–215), H. Zörner (pp. 216–226), and H. R. Tolley (pp. 227–239); Problems of Milk Marketing Regulation, by W. H. Bronson (pp. 297–307); The Agricultural Situation in Belgium, by G. Baptist (pp. 322–327); Compulsory Syndicates for Regulating Agricultural Prices, by C. von Dietze (pp. 328–341); How the Natural Products Marketing Act Operates in British Columbia, by F. M. Clement (pp. 342–355); Government Regulation of Public Utilities in the United States, by M. C. Burritt (pp. 356–366); Relation of Changes in Meat Production and Consumption to Changes in Farm Income From Live Stock in the United States, by P. Richards (pp. 367–373); The Work of the Agricultural Service of the International Labour Office, by F. von Bülow (pp. 374–380); Part-Time Holdings for Urban Workers, by H. Krause (pp. 381–390) and K. Hood (pp. 391–398); Problems of Consumption of Agricultural Products, by E. P. Cathcart (pp. 412–421) and R. B. Forrester (pp. 422–429); The Evolution of the American Family Farm, by A. Boss (pp. 484–491); and Changes in Chinese Currency and Their Effect Upon Commodity Prices, by A. B. Lewis (pp. 499–506).

A list of the persons attending this conference, a brief history and the constitution of the conference, and a list of its members are also included.

[Investigations in agricultural economics and farm management by the Illinois Station, 1935–36] (*Illinois Sta. Rpt. 1936, pp. 7–9, 172–218, figs. 6*).—Results of investigations not previously noted are reported as follows: (1) Table, by H. W. Mumford and J. D. Bilsborrow, showing by the type-of-farming areas of the State, as compared with 1929, the use of lands in 1934, the intended use in 1936, and the intended use in 1936 with farm practices adjusted to maintain soil fertility and to control erosion; (2) tables, by H. C. M. Case and M. L. Mosher, comparing the 10-yr. average capital investments, receipts and net increases, expenses and net decreases, returns, etc., on all and on the 19 most profitable and 19 least profitable of 57 farms enrolled in the farm bureau farm management service in Livingston, McLean, Tazewell, and Wood-

ford Counties, and the cash receipts, cash expenses, and other factors for all farms included in the service by the years 1926–35; (3) table, by P. E. Johnston, J. B. Cunningham, Case, and E. L. Sauer, showing by counties and groups of counties a summary of business records obtained from 1,639 farms in 1935; (4) some findings, by E. J. Working, as to the sources of the United States supply of soybeans, 1912–36, the factory consumption of soybean oil in the United States for major purposes, 1929–36, the factors influencing the demand for and prices of soybeans, etc.; (5) findings as to reasons for the expansion of soybean acreage in Illinois, by R. C. Ross; (6) tables, by Case, R. H. Wilcox and E. B. Colegrove, showing the growing and harvesting costs, taxes, interest on land, and yields per acre, 1933–34, of important crops in east-central Illinois, and the average and extreme variations in the man labor, horse work, seed, machinery investment, and pounds of twine used per acre in 1933 on 33 Champaign and Piatt County farms; (7) table, by Ross, showing the total acreages cut, proportions of home and custom cutting, and the average harvesting costs per acre of wheat, oats, and soybeans for 83 combines in 1935; (8) some findings, by R. R. Hudelson, as to percentages of lands in different crops in different townships in the same county; (9) suggestions for desirable adjustment in land use—crop and livestock production—based on a study by Mumford and Case in cooperation with C. L. Holmes and F. F. Elliott, of the Bureau of Agricultural Economics, U. S. D. A.; (10) findings, by Johnston and J. E. Wills, as to the average (1930–34) combined man labor, horse, and machinery costs per crop acre on 6,390 central Illinois farms with different types of power; (11) findings, by Case and J. Ackerman, as to earnings on investment on farms operated under different types of tenure; (12) findings, by C. L. Stewart, as to the trends, 1900–1935, of number of farms, acreage and value of Illinois farms operated by managers, owners, part-owners, and tenants, and the relation between valuation of lands and percentage of tenancy; (13) table, by Wilcox and L. E. Card, comparing the average costs of producing eggs and pullets in 36 farm flocks in 1935 with the costs found in a study in the years 1932, 1933, and 1934; (14) findings, by R. C. Ashby and Card, as to the effects of method of shipment and initial quality of eggs on the quality of shipments on their arrival in New York City; (15) findings, by Johnston and V. W. Kelley, as to the factors affecting orchard profits on 41 farms studied in 1935; and (16) findings, by J. W. Lloyd, as to possible methods of reducing packing shed costs for apples, peaches, and pears.

[Investigations in agricultural economics by the Missouri Station, 1935–36] (*Missouri Sta. Bul. 387 (1937), pp. 11–17, fig. 1*).—Included are (1) a table by O. R. Johnson showing the changes from 1931 to 1933 in Atchison County and from 1929 to 1933 in Nodaway and Linn Counties of approximately 90 factors entering into the analysis of the farm business, grouped under the headings size factors, production factors, use of labor and equipment, investment factors, and earnings of capital and wages of labor; (2) some general findings as to the problem areas in Missouri as shown by a study of adjustments in farming by regions and type-of-farming areas from the standpoint of agricultural adjustment and planning, including soil conservation, by Johnson and G. T. Barton; (3) a table by B. H. Frame based on 384 records showing the average quantities, prices, and values of different home-produced commodities used in farm homes of the State; and (4) tables by Frame showing the time required for mowing hay, raking hay, plowing land, and cutting small grain, using various power units.

The world agricultural situation in 1935–36 (*Roma: Internatl. Inst. Agr., 1937, pp. VIII+352+[1]*).—This commentary on the International Yearbook of Agricultural Statistics for 1935–36 and 1936–37, noted on page 271, is the

seventh volume in the series previously noted (E. S. R., 76, p. 705). In part 1, world agriculture, "the principal factors of the present recovery in world agriculture are analyzed, and the nature of the revival, as well as the problems to which it gives rise, are discussed. . . . A special chapter deals with the markets and prices of the principal agricultural products." The information is brought up to the beginning of 1937. In part 2, agricultural policy and conditions in the different countries, information relating to government measures of farm relief and the economic conditions of agriculture is brought together for each country.

American agricultural conditions and remedies (*New York: Natl. Indus. Conf. Bd., Inc., [1936], pp. VI+57, [figs. 2]*).—This preliminary general review of the findings in the study begun in 1935 is divided into four sections—the American agricultural picture today, the measurement of agricultural conditions, past attempts to help agriculture, and positive programs for agricultural improvement.

"Study shows that there is no disparity between real farm and city income sufficiently large and general to support the doctrine that forced redistribution of money incomes would provide a lasting solution of farm problems. Likewise, analysis of experiments made in this and other countries shows that concerted limitation of production beyond the natural adjustments made by the millions of farmers gives no permanent help. . . . The bulk of our farmers may improve their economic position and benefit the Nation socially by producing a larger share of their requirements on their own farms. . . . Farmers also have many sources of income outside the scale of products, and these may be further enlarged with the cooperation of business and industry. New uses and expanded old uses are being developed for farm products. By abolishing malnutrition in the cities and on the farms, and stimulating the demand for an improved dietary, demands for food will be expanded. Farm costs may be reduced by better farming. The farmer can also be assured of a larger share of the domestic market by more effective tariff policies. Since farm income and factory wages move up and down together, the greatest chance to improve farm prosperity is to improve general business activity and increase the general national productivity."

Historical aspects of agricultural adjustment (*Agr. Hist., 11 (1937), No. 3, pp. 221–251, figs. 4; also in Jour. Farm Econ., 19 (1937), No. 2, pp. 605–635*).—Included are the following papers: The Historical Approach to the Economic Problems of Agriculture, by H. C. Taylor (pp. 221–223); A Century of Adjustments in a New Hampshire Back Area, by H. C. Woodworth (pp. 223–237); and The Depression of 1873–79, by O. V. Wells (pp. 237–249), with discussion by O. C. Stine (pp. 249–251).

Foreign Agriculture, [October 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), No. 10, pp. 469–528, figs. 7*).—Included are an article on World Agriculture—Conditions and Trends (pp. 471–502), which is part of chapter 1, part 1, of The World Agricultural Situation in 1935–36 noted on page 266; an article on The Hog Industry in Yugoslavia, by H. E. Reed (pp. 503–524); and notes on recent developments in foreign agricultural policy, as follows: Agrarian policy developments in Argentina, Canary Islands adjust tomato output to export demand, operation of the Hungarian land settlement law, and Latvia to encourage increased agricultural output.

The land and the unemployed industrial worker in Great Britain, P. Lamartine Yates (*Internatl. Labor Off., Genève, Internatl. Labor Rev., 34 (1936), No. 3, pp. 339–360*).—The various types of land settlement that have been used, their advantages and disadvantages, and the factors tending to success or failure are discussed. Results on similar holdings in other countries are also described.

Tenure of new agricultural holdings in several European countries, E. Kraemer (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 2 (1937), pp. [4]+92*).—This report deals with certain aspects of land tenure in England, Wales, Scotland, Germany, Denmark, Norway, and Sweden.

What is an equitable farm lease? A preliminary report, C. E. Allred and E. E. Briner (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 52 (1937), pp. [1]+III+35, figs. 6*).—"This is a preliminary study of the contractual relation of landlord and tenant, based on actual contracts between landlords and tenants, with various types of rental arrangements." The farms studied were located in the northern part of the east-central part of the State. A method for comparing contributions and receipts of landlord and tenant and how certain items—valuation of property, interest, depreciation, repairs, insurance, tax, feed bought, wages for labor, team labor, value for management, risk, etc.—should be valued are discussed. An analysis is made of the contributions and receipts of the landlord and tenant on a farm under a cropper contract, one under a two-thirds crop-share contract, and one under a half crop-share contract.

Human and physical resources of Tennessee.—X, Agriculture, C. E. Allred, S. W. Atkins, and W. E. Hendrix (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 53 (1937), pp. [1]+V+130-166, figs. 11*).—Included are data as to the number and size of farms, farm population, income, and wealth, and production of different crops and kinds of livestock.

Human and physical resources of Tennessee.—VII, Land utilization. VIII, Land drainage, C. E. Allred, S. W. Atkins, and W. E. Hendrix (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 48 (1937), pp. [1]+V+84-101, figs. 7*).—In the section on land utilization, tables, charts, and maps are included and discussed, showing the present land use in Tennessee, by regions, and the changes that have taken place in the acreage in total farm area, improved farm lands, and crop lands harvested. In the section on drainage, data are discussed regarding distribution and development of, condition of land in, and delinquency of drainage districts in the payment of interest and bonds and the acreages of land provided with drainage.

Studies of the range sheep business in Nevada: Physical factors, receipts, costs, and earning power balance, C. E. Fleming and C. A. Brennen (*Nevada Sta. Bul. 145 (1937), pp. 13, figs. 4*).—The findings as to receipts, costs, and earning power of sheep outfits, studied from 1933 to 1936, inclusive, are presented. The number of outfits studied increased gradually from 11 running 51,257 sheep in 1933 to 20 running 92,726 sheep in 1936. Tables are included and discussed showing for each year (1) the weather conditions and data as to average death losses, lamb crop, weight of lambs, pounds produced and sold per sheep unit, and wool sold per unit; and (2) by items per sheep unit the receipts, carrying cost, herd charges, and earning power balance, and the inventory value per head of mature sheep. Due to weather and economic conditions during the period studied, no averages for the 4 yr. are included.

The total receipts per sheep unit were \$3.15 in 1933, \$3.28 in 1934, \$4.17 in 1935, and \$5.10 in 1936. The total costs, excluding all interest charges, were \$3.91, \$4.26, \$3.57, and \$3.84, and the earning power balances per sheep unit −76 ct., −\$1, +60 ct., and +\$1.26 in the respective years.

Economic survey of the live-poultry industry in New York City, G. W. Sprague, A. Sturges, and J. H. Radabaugh (*U. S. Dept. Agr., Misc. Pub. 283 (1937), pp. 116, figs. 48*).—This survey was made in cooperation with the Agricultural Adjustment Administration and the New York Live Poultry Industry Code Authority. It was begun because of the code supervisor's powers and duty to study problems of the inspection, cost of handling, and method of arriving at the daily market price of poultry, and to make recommendations

to the Secretary of Agriculture, and to cooperate with the Bureau of Agricultural Economics in the preparation of uniform grades, standards, and terminology for the various products of the industry. Studies of the consumption of poultry and the agencies involved in live-poultry marketing were also included. Most of the data were collected before January 1, 1936, and did not include changes in the poultry industry resulting from the amendment of the Packers and Stockyards Act, 1921, relating to live-poultry dealers and handlers, which became effective in New York on November 25, 1935. The data are analyzed and discussed under the following heads: Marketing organization of the poultry industry; poultry trends in volume and value at New York City; physical organization of the live-poultry market in New York City; live-poultry dealers in New York City; wholesale dealer organization; influence of Jewish customs on the live-poultry industry; prices, grades, and inspection; consumption of poultry in New York City; and costs and margins in poultry marketing.

Farmers grain elevators: Factors influencing their successful operation, L. J. NORTON (*Illinois Sta. Circ. 476 (1937), pp. 18, figs. 3*).—This circular, dealing with the factors influencing the successful operation of farmers' grain elevators, is based chiefly on data for the year ended June 30, 1936, for 98 farmers' elevators. Rates earned, effects of volume of business on earnings and of volume of grain and proportion of merchandise sales of total business on expense per dollar of sales, gross margins earned on grain, earnings from merchandise, and net worth of companies are discussed. A set of questions designed to assist in the analysis of an individual company is included. Some of the findings were as follows: "With profit margins and expenses as they were in 1935, a company would have to handle around 300,000 bu. of grain or supplement the grain business with an equivalent volume of merchandise business in order to earn ordinary rates of return on the capital required in the business. . . . Expenses of operation decline as the volume of grain handled increases. . . . The margins taken on merchandise average about three times as large as those taken on grain, when measured by percentage of sale value. This higher margin approximately measures differences in costs of handling merchandise and grain. Margins taken on merchandise decrease as the volume of grain handled increases and as the relative importance of merchandise in the business decreases. The gross margin earned on grain is not closely correlated with the volume of grain handled, except for corn, where the margin declines with volume. The variation from year to year in margin per bushel of grain is closely related to the trend in the price of grain during the year. . . . Differences in margins earned on grain, more than any other factor, explain the differences in the earnings of the companies handling adequate volumes of business. The rate at which merchandise is turned over influences the capital requirements of a merchandise business. Companies handling relatively little merchandise have more rapid turnovers than those for which merchandise sales are more important. Receivables materially increase capital requirements. As an average for the companies studied, receivables represented nearly 40 percent of the current assets."

Marketing strawberries cooperatively in Tennessee, C. E. ALLRED, S. W. ATKINS, B. H. LUEBKE, E. J. HOPKINS, and S. R. NESKAUG (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 43 (1937), pp. [1]+IV+31, figs. 8*).—Data were collected by field trips from 88 growers representing members of active and inactive cooperative associations and growers patronizing independent dealers. The problems of strawberry marketing; the distribution and trend in number of associations; organization, control, and financing of associations;

the purpose of organization and the functions attempted; and the accomplishments of cooperative associations are discussed.

Marketing livestock cooperatively in Tennessee, C. E. Allred, J. P. Butterfield, and S. R. Neskaug (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 49 (1937), pp. [1]+III+37, figs. 4*).—The findings in a study made in 1936 are presented in chapters on producing areas; trend, location, and size of associations; cooperative marketing of sheep and wool; other meat animals marketed cooperatively; cooperative marketing of poultry; and some factors in the success and failure of livestock marketing associations.

"At present the number of cooperative purchasing and marketing associations is decreasing, but membership and volume are increasing. . . . Inauguration of motor transportation permits quicker delivery and less shrinkage, thus encouraging direct marketing by producers. Auction companies and livestock buyers are strong competitors of the cooperative marketing agencies."

Milk: Report of Reorganisation Commission for Great Britain, A. E. Cutforth et al. (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 44 (1936), pp. X+362, fig. 1*).—This is the report of the commission appointed February 11, 1935, to consider the working of organized milk marketing under milk marketing schemes and the extent to which and manner in which organization could be facilitated by closer cooperation between the marketing boards in Great Britain and Great Britain and Northern Ireland. The milk marketing schemes and their effects and the general principles relating to milk marketing are discussed and recommendations made for the future of organized milk marketing.

[Use of milk and dairy products in Burlington, Vermont] (*Vermont Sta. Bul. 425 (1937), pp. 16, 17*).—Findings based on interviews with over 3,600 families are included as to the number of families using fresh and canned milk and cream; per capita use of milk, cream, and cheese; sources of milk purchases; and effects of income on amount of milk drunk and purchased.

Organization and operation of cooperative irrigation companies, W. A. Hutchins (*Farm Credit Admin. [U. S.], Coop. Div., Circ. C-102 (1936), pp. IV+54, figs. 16*).—The legal basis, organization and capital structure, management and policies, operation and maintenance, accounting practices, and financial policies of mutual irrigation companies are described. A list of selected references is included.

***Farmers' mutual fire insurance in Tennessee.*—I, Development,** C. E. Allred, T. L. Robinson, and B. H. Luebke (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 46 (1937), pp. [1]+III+21, figs. 9*).—The purposes of this first part of the study are "to show the need, status, growth, distribution, and accomplishments of farmers' mutual fire insurance companies in Tennessee."

Index numbers of prices received by Tennessee farmers, 1910–1936, with comparisons, C. E. Allred, P. T. Sant, and C. M. Smith (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 41 (1937), pp. [1]+III+37, figs. 21*).—"The Tennessee index of farm prices, as constructed in this study, contains 22 products of major importance. The fixed-weight aggregate formula is used, with a base period from 1910 to 1914, inclusive, and weighted by average annual marketings of these commodities for the period 1924 to 1928." Index numbers are also included for the following groups: Grains, cotton and cottonseed, dairy products, poultry products, meat animals, and miscellaneous crops, including sweetpotatoes, potatoes, tobacco, hay, wool, and apples. The indexes for Tennessee are compared with those for the United States and other States.

"The composite index of Tennessee farm prices rose to 227.7 percent of the prewar period during 1919, and fell to 127.7 percent in 1921. For the next 8 yr. prices fluctuated around 150 percent of the base period. In 1929 prices fell, and

in 1932 reached the extreme low of 63.8 percent of the base period. Beginning in 1933 general recovery helped raise the farm price index, and in 1936 it reached 119.8 percent."

Seasonal prices of farm products in Tennessee, 1908 to 1936, C. E. ALLRED, P. T. SANT, and C. M. SMITH (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 51 (1937), pp. [1]+III+45, figs. 35*).—A table and charts are included and discussed showing the seasonal variations in prices of the more important agricultural products of the State. "The ratio-to-trend method is used in measuring the seasonal variation for cotton, cottonseed, corn, wheat, Irish potatoes, sweetpotatoes, hogs, beef cattle, lambs, and eggs. The simple average method is used for oats, barley, rye, apples, hay, veal, calves, sheep, chickens, butter, milk, wool, cabbage, tomatoes, and peaches. The link-relative method is used for mules, horses, and milk cows."

Regional differences in farm price of hogs, Tennessee and United States, C. E. ALLRED, P. T. SANT, and C. M. SMITH (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 37 (1937), pp. [1]+II+42, figs. 20*).—"The purposes of this monograph are to show the geographical variations in prices paid to producers of hogs in Tennessee; the variation in hog prices in certain other States and United States, compared with Tennessee; and discuss certain factors contributing to these regional differences."

Crops and Markets, [September 1937] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), No. 9, pp. 181–204, fig. 1*).—Included are seasonal reports on the conditions of important crops, fertilizer sales in cotton States, sugarcane, sugar beets, and wheat (by classes) production; crop and livestock production reports; index numbers of prices paid and received by farmers; and market reports of cotton, dairy and poultry products, feeds, seeds, grains, livestock, and livestock products.

International yearbook of agricultural statistics, 1935–36 and 1936–37 (*Internatl. Inst. Agr. [Roma], Internatl. Yearbook Agr. Statis., 1935–37, pp. XXXV+1009*).—This volume continues the series previously noted (E. S. R., 76, p. 712). The figures for 1936–37 are generally provisional. Other changes consist of the inclusion of data on the distribution of crops and on plant and animal production in a number of additional countries, expansion and improvement of the statistics of vine products and coffee, a breaking up of the data on the production of and trade in citrus fruits, and the addition of statistics on exports and imports of dates.

RURAL SOCIOLOGY

[Miscellaneous contributions on rural sociology] (*Rural Sociol., 2 (1937), No. 1, pp. 10–28, 46–50, 59–75*).—Among the contributions here presented are Structural Changes in Rural Russia, by N. S. Timasheff (pp. 10–28); Relationship Between Social and Economic Conditions in Rural India, by S. K. Bedekar (pp. 46–50); The Modifying Influence of the Family-Farm Upon Choice of Occupation, by R. H. Holmes (pp. 59–65); and A Qualitative Study of Depopulation in a Remote Rural District, 1900–1930, by C. F. Reuss (pp. 66–75).

Research memorandum on rural life in the depression, D. SANDERSON (*Social Sci. Res. Council Bul. 34 (1937), pp. VII+169*).—This is one of a series of 13 monographs on rural-life research sponsored by the Social Science Research Council to stimulate the study of the effects of depression on social institutions.

"The length of the agricultural depression and the sudden reversal from the prosperity of the first two decades of this century brought about an intensive scientific study of the economic problems of agriculture which has

demonstrated its utility. If the problems of the social aspects of rural life which have been made acute during the industrial depression have revealed the importance of obtaining a more accurate and adequate knowledge concerning them, through scientific methods of research, and if this situation gives rise to the means for carrying on such research, both under governmental and private auspices, it is probable that a more realistic view of the problems of rural life may be obtained and that facts may be made available which will implement measures for rural improvement."

The effect of the depression on tenancy in the Central States, D. Sanderson (*Rural Sociol., 2 (1937), No. 1, pp. 3–9*).—Considering both the North and the South, the largest proportion of tenancy was in the Central States. In all of the North Central States the proportion of tenancy increased, but in Illinois, Wisconsin, Minnesota, and Iowa the percentage of all farms operated by tenants increased less than from 1925 to 1930. In the South Central States the percentage of tenants declined in all States except Kentucky, in which the increase was less than from 1925 to 1930, and Tennessee, which remained the same. These facts indicate that the effect of the depression on tenancy was very different in the North than in the South, and different in some States from others.

Unemployment relief in Arizona from October 1, 1932, through December 31, 1936, with a special analysis of rural and town relief households, E. D. Tetreau (*Arizona Sta. Bul. 156 (1937), pp. 69–128, figs. 5*).—An analysis made in cooperation with the Federal Works Progress Administration.

Beet workers on relief in Weld County, Colorado, O. F. Larson (*Colorado Sta. Res. Bul. 4 (1937), pp. [3]+31, fig. 1*).—A survey was made of 25 percent of the rural-residing "Spanish-speaking" cases which received emergency relief in Weld County at any time during the period February–October 1935, inclusive, and which had a head whose usual occupation was beet laborer or who took employment at beet labor upon leaving the relief rolls. This sample was composed of 231 cases, of which 192 were located as still resident within the county at the time of the survey in the spring of 1936.

The average size of a case was 5.6 persons. About half the population was in the "dependent" age groups of 15 or less, or 65 or over. Each case received public assistance during 1935–36 almost 6 mo. out of the 12; the average amount received was $172. Beet laborer has been the usual occupation for most of the heads of these cases a relatively long time: 6 out of every 10 have been so engaged 10 yr. or more. Cost of living for cases having two or more persons and which were operated as a household for the full 12-mo. period studied averaged $564 per case, or $120 per consumption unit. Food was the most important single item in the cost of living, accounting for one-half of the total costs. Practically no school attendance was recorded for persons 16 yr. of age and over. Males missed an average of 35 days of school out of approximately 180, and females an average of 41 school days during the 1935–36 term. A high birth rate is indicated by the ratio of 804 children under the age of 5 per 1,000 women aged 15–44; the unbroken families reported an average of 5.3 live births. Infant mortality rates have been high.

The rural relief population of ten Ohio counties, June 1935, C. L. Folse and C. E. Lively (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 100 (1937), pp. [3]+19, pls. 5*).—This bulletin reports the findings of a survey.

Farmers on relief and rehabilitation, B. Asch and A. R. Mangus (*Works Prog. Admin. [U. S.], Div. Social Res., Res. Monog. 8 (1937), pp. XX+226, pls. 8, figs. 18*).—This study was undertaken to assemble information concerning the relief and rehabilitation needs of farmers and to clarify the problems of the farm families that became dependent on public assistance during the depression. Data are presented on the extent of the farm relief problem and the underlying

causes of distress, the development of the administrative programs which were formulated to meet the situation, the types and amounts of assistance given farm households, the social characteristics of these households, the relation of farmers on relief to the land with respect to residence and tenure and their relation to the factors of production and experience, and the trend of farm relief through 1935.

An analysis of methods and criteria used in selecting families for colonization projects, J. B. Holt (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 1 (1937), pp. [4]+54*).—The author presents the first phase of the results of research designed to supply administrators with needed information concerning the problems and conditions with which they deal practically.

Rating marginal homes from observation, E. L. Kirkpatrick (*Rural Sociol., 2 (1937), No. 1, pp. 51–58*).—Welfare programs should be based upon careful studies rather than mere guesses.

Recent trends in rural planning, W. E. Cole and H. P. Crowe (*New York: Prentice-Hall, 1937, pp. XV+579, pl. 1, figs. 55*).—In this compilation of various attempts at solving rural problems and planning rural life of individual adequacy and social effectiveness, experiences in rural planning in this and other countries are drawn upon.

Human and physical resources of Tennessee.—IX, Population, C. E. Allred, S. W. Atkins, B. D. Raskopf, and W. E. Hendrix (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 50 (1937), pp. [1]+V+102–127, figs. 11*).—Thirty-four percent of the population of Tennessee is urban, these being distributed in 41 counties. Memphis, Nashville, Chattanooga, and Knoxville have 70.6 percent of the total urban population of the State. The proportion of urban population increased from about one-fifth in 1910 to about one-third in 1930. Nineteen percent of the State's population was rural nonfarm in 1930. For every 100 females there were 99.5 males in 1930. In the farm population males exceed females. Gainfully employed persons in Tennessee constitute 36.7 percent of the total population.

Agriculture is the most important occupation with 39 percent, and manufacturing and mechanical industries rank second with 21 percent. Trade and domestic service employ about 10 percent each, and mining, forestry, and fishing combined only 2 percent.

The effect of recent public policies on the future population prospect, O. E. Baker (*Rural Sociol., 2 (1937), No. 2, pp. 123–141, figs. 8*).—In this contribution the author discusses the relief program, the Agricultural Adjustment program, the increase in farm population, 1930–35, the agricultural dilemma, and Government policies and population growth, as they affect the future population prospect of the Nation.

The physical equipment of homes in relation to their residential holding power, J. L. Hypes (*Jour. Home Econ., 29 (1937), No. 6, pp. 397–404, fig. 1*).—The data presented are taken from a larger study on the mobility of the rural population of Connecticut which was noted previously (E. S. R., 72, p. 412). The relationship of the quality of the paternal homes to their residential holding power over sons and daughters 16 yr. of age and older was studied in 616 rural families. Contrary to the results among the sons, the daughters showed a rather marked disposition to leave the poorly equipped paternal home and to remain in the well-equipped home.

Membership of the American Farm Bureau Federation, 1926–1935, R. Russell (*Rural Sociol., 2 (1937), No. 1, pp. 29–35, fig. 1*).—The membership of the American Farm Bureau Federation was 278,869 in 1926, and in 1935 it

was 280,916. From 1927 to 1930 it rose to a high of 321,203 and fell to a low of 158,356 by 1933. Fluctuations in membership tended to follow in general the changes in farm income.

Rural fiction as interpreter of rural life, C. B. SHERMAN (*Rural Sociol., 2 (1937), No. 1, pp. 36–45*).—Prior to 1900 only three novels were published that are now considered as genuine studies of American rural life, but rural fiction has since greatly increased in diversity and volume. Many examples are presented by the author.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Courses in agricultural economics and rural sociology, land grant colleges, 1935–1936, C. E. ALLRED and W. E. HENDRIX (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 39 (1937), pp. [1]+II+20, figs. 4*).—"The purpose of this study is to show the kind and number of courses offered in agricultural economics and rural sociology by State agricultural colleges." The total number is 1,089, of which 872 are undergraduate courses.

Federal legislation, regulations, and rulings affecting cooperative extension work in agriculture and home economics (*U. S. Dept. Agr., Misc. Pub. 285 (1937), pp. 31*).—This is a revision of the material relating to cooperative extension work in agriculture and home economics (E. S. R., 49, p. 195).

Farming attracts large share of 4-H club members (*Illinois Sta. Rpt. 1936, pp. 9–11*).—Data collected by D. E. Lindstrom and H. W. Mumford showing the occupational preferences of 876 boys in north-central Illinois in 1932 are tabulated to show the preferences of farm boys (members and nonmembers of 4-H clubs) and town boys.

FOODS—HUMAN NUTRITION

[Foods and nutrition studies by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 123–129, 285–297, figs. 4*).—This progress report deals with a continuation of work (E. S. R., 77, p. 235) on the availability of calcium in dried skim milk powder and in raw liquid skim milk and a comparison of dried skim milk powder with other high calcium foods in the diet, by B. W. Fairbanks and H. H. Mitchell; a series of studies on the metabolism of lead and arsenic compounds in rats and the conditions governing the accumulation of lead and arsenic in the body, by Mitchell, J. B. Shields, W. A. Ruth, and J. P. Outhouse; the dietary requirements for successful lactation in the rat, by Outhouse; the relative vitamin A value of several varieties of yellow corn, by Outhouse and M. Hathaway; the use of the Birch-Hirschfeld photometer in vitamin A studies, by Outhouse; the effect of lactose on the mineral metabolism of rats and of humans, by Outhouse, I. Twomey, and Hathaway; the separation of the important constituents of cornstarch and the behavior of starch under varying conditions, by S. Woodruff and M. M. MacMasters; the effect of bleaching on the baking quality of Illinois wheat flours, by Woodruff et al.; and the use of soybeans as human food, by Woodruff and H. Klaas.

The influence of the condition of the ewe on the cooking quality of mutton, J. A. CLINE and I. M. ECKBLAD (*Missouri Sta. Bul. 387 (1937), pp. 70, 71*).—In this progress report the carcasses from old thin ewes, old fat, and young fat ewes were compared as to cooking losses, cooking time, palatability, and serving value.

Some milk superstitions, J. H. FRANDSEN (*Jour. Home Econ., 29 (1937), No 4, pp. 242, 243*).—In this contribution from the Massachusetts Experiment Station facts are cited from the literature to discredit a number of false notions about the use of milk in the diet.

Contribution to data on the composition of some of the more common vegetables, R. LOUGHLIN (*Jour. Home Econ., 29 (1937), No. 4, pp. 255–257*).—In this contribution from the U. S. D. A. Bureau of Home Economics, data are given on the amount of refuse and the calcium and phosphorus content of spinach and beet greens (2 samples of each) and rutabagas, chard, beet roots, and kale (1 sample of each), purchased on the retail market. The methods used were those of the A. O. A. C. for 1930.

Refuse content equaling 45 percent and over is reported for beet roots and kale leaves and from 15 to 33 percent for the other vegetables tested. Rutabagas were 90 percent edible, chard 84, spinach 70–79, beet greens 67–85, kale 55, and beet roots 39 percent. Expressed as percentages of fresh material, the calcium values were for kale 0.201 percent, beet leaves 0.131–0.191, chard 0.117, spinach 0.07–0.115, rutabagas 0.055, and beet roots 0.02 percent. The following values are given for phosphorus content: Kale 0.082 percent, spinach 0.041–0.106, beet roots 0.053, chard 0.052, beet greens 0.046–0.052, and rutabagas 0.042 percent.

Deuterium as an indicator in the study of intermediary metabolism, I–VIII (*Jour. Biol. Chem., 111 (1935), No. 1, pp. 163–192, figs. 4; 113 (1936), No. 2, pp. 505–510; 114 (1936), No. 2, pp. 381–396, fig. 1; 115 (1936), No. 3, pp. 635–640; 117 (1937), No. 2, pp. 485–490*).—Eight papers are presented in this series.

I. [*Introduction*], R. Schoenheimer and D. Rittenberg (pp. 163–168).—The use of the hydrogen isotope deuterium is proposed for the study of intermediary metabolic processes, and the preparation of deuterium-containing stearic acid from linoleic acid is described. Analysis for deuterium serves to indicate the route taken by organic molecules containing stably bound hydrogen atoms after administration to the organism. The possibilities and limitations of the physiological applications of deuterium are briefly discussed.

II. *Methods*, D. Rittenberg and R. Schoenheimer (pp. 169–174).—The authors discuss the methods for the generation of deuterium gas from heavy water, the combustion of deuterium-containing organic substances, the purification of small amounts of water, and the determination of the deuterium content in such samples.

III. *The rôle of the fat tissues*, R. Schoenheimer and D. Rittenberg (pp. 175–181).—Mice were fed a diet containing whole wheat bread and 20, 4, and 1 percent deuterium-containing partially hydrogenated linseed oil for from 2 to 10 days. The deuterium content of the fat depots, of the fat of the internal organs, and of the body fluids was then determined.

The experiments indicate that the largest part of the dietary fat is deposited in the fat tissues before it is utilized, since in the mice receiving a diet containing 1 percent of fat over a 4-day period 47 percent of the ingested fat was recovered in the fat depots and heavy water equivalent to 20 percent of the ingested fat was found in the body fluids, with only a small amount of the absorbed fat present in the internal organs.

IV. *The mechanism of coprosterol formation*, R. Schoenheimer, D. Rittenberg, and M. Graff (pp. 183–192).—Feeding experiments were carried out on dogs to which coprostanone into which deuterium had been introduced to form coprostanone 4–5d_2 and cholestenone were fed. One experimental diet was composed of dog biscuit with small amounts of pork lard, Liebig meat extract, and cod-liver oil, and the other was largely chopped meat with pork lard and ether-extracted wool. A healthy 24-year-old human subject was given 1 g of coprostanone 4–5d_2 dissolved in butter and eaten with bread daily on 2 successive days. Grape seeds eaten 5 hr. before and after the test meals served as an indicator in the stools.

The cholestenone was converted into cholesterol by the dog maintained on the biscuit ration and into coprosterol by the dog receiving the meat diet. The coprostanone was converted into coprosterol by the dog and human subject.

V. *The desaturation of fatty acids in the organism*, R. Schoenheimer and D. Rittenberg (pp. 505–510).—The authors demonstrated that unsaturated fatty acids containing deuterium can be isolated from the fat of mice which have been fed fats prepared from the methyl esters of the fatty acids from linseed oil and saturated with deuterium. The unsaturated fatty acids freed from the animal body were high in deuterium, and it is concluded that they were derived directly from the saturated ones which were fed.

VI. *Synthesis and destruction of fatty acids in the organism*, R. Schoenheimer and D. Rittenberg (pp. 381–396).—In the following experiments the hydrogen isotope deuterium was successfully used as an indicator: The synthesis and destruction of fatty acids in mice on a carbohydrate-rich diet, the separation of unsaturated fatty acids, ozonization and oxidation of unsaturated acids and the isolation of azeliac acid from the oxidation mixture, and a study of the development of chick embryos in the medium of heavy water.

VII. *Studies in bile acid formation*, R. Schoenheimer, D. Rittenberg, B. N. Berg, and L. Rousselot (pp. 635–640).—To test the possibility of converting coprostanone into the bile acids, 3 dogs with bile fistulas were injected intravenously with an emulsion of coprostanone 4–5d_3 containing 3.44 atoms percent of deuterium, and a deuterium-containing unsaponifiable substance was recovered in the fistula bile. The cholic acid isolated from the bile did not contain any deuterium. The experiments indicate that coprostanone is not an intermediate product in the hypothetical conversion of cholesterol into cholic acid.

VIII. *Hydrogenation of fatty acids in the animal organism*, D. Rittenberg and R. Schoenheimer (pp. 485–490).—To determine whether the animal body is capable of transforming unsaturated into saturated fatty acids, experiments were conducted on mice fed unsaturated deutero fatty acids prepared from linoleic acid desaturated biologically by mice. The saturated fatty acids were isolated from the total fatty acids of the animal body, using the deuterium content as the indicator. These data, together with previous findings, indicate that saturation and desaturation of fatty acids in animals is a physiologically reversible process.

The influence of carbohydrate and nitrogen metabolism in the normal nutritional state, P. S. Larson and I. L. Chaikoff (*Jour. Nutr., 13 (1937), No. 3, pp. 287–304*).—Seven normal adult female dogs receiving a synthetic diet were brought into nitrogen equilibrium in which the 24-hr. nitrogen excretion over long periods of time rarely varied by more than 0.3 g. At various intervals following the ingestion of the daily meal given in the morning additional quantities of carbohydrate were fed. The dogs were catheterized just before the meal and some received a second catheterization before an additional evening meal. Ammonia, urea, total nitrogen, and inorganic sulfur were determined in the urine and nitrogen in the feces samples.

From the experimental results the authors conclude that in the normal nutritive state the single administration of extra carbohydrate spares nitrogen only when it is ingested at a definite time in relation to the ingestion of protein, and that no nitrogen retention occurs when the extra carbohydrate is administered at intervals beyond the limits of 4 hr. before and 4 hr. after the ingestion of the daily meal. Thus a time factor is established in the protein-sparing action of carbohydrate, and it is suggested that carbohydrate effectively spares protein only if it is available to the animal at a time when an increase in protein metabolism is in progress. The nitrogen spared under the influence

of a single feeding of extra carbohydrate is not permanent and its elimination begins several hours after its storage is effected. Nitrogen retention results from repeated daily additions of extra carbohydrate at the same time that protein is ingested, but continues only as long as the daily administration of extra carbohydrate is maintained.

An increased nitrogen output in the early hours after protein ingestion was observed for several days after an interruption of extra carbohydrate feeding, which would seem to indicate that the immediate fate of ingested protein is determined in part by the animal's previous carbohydrate intake and that the nitrogen metabolism in the animal is in a "continuing" state.

Some aspects of protein intake in relation to growth and the rate of calcification, R. T. Conner and H. C. Sherman (*Jour. Biol. Chem., 115 (1936), No. 3, pp. 695–706*).—In continuation of previous studies (E. S. R., 75, p. 881), experiments are reported on the effects of protein enrichment with and without increases in the calcium or calcium and phosphorus content of the stock diet 16, which consists of five-sixths ground whole wheat and one-sixth dried whole milk, with sodium chloride added in an amount equivalent to 2 percent of the weight of the wheat, and contains from 0.19 to 0.2 percent of calcium, 0.44 of phosphorus, and 14 percent of protein. In some of the tests the diet was also enriched in its vitamin values. The experiments were made on matched lots of rats which had been reared on diet 16 and were carried through the second and third generations.

Increasing the protein content of the diet to 18.8 percent resulted in a more rapid growth from the twenty-eighth to the fifty-sixth day of age and also an increased rate of calcification. When the calcium content was increased from 0.64 to 0.8 percent, increasing the protein content to from 14 to 18.8 percent gave variable results, but when the protein content was increased to 25 percent a further increase in growth was noted in both male and female rats. A protein content of 40 percent, with or without a simultaneous increase in vitamin values, did not improve the growth rate over that shown with 25 percent.

The effect of liberal intakes of calcium or calcium and phosphorus on growth and body calcium, E. W. Toepfer and H. C. Sherman (*Jour. Biol. Chem., 115 (1936), No. 3, pp. 685–694*).—In continuation of earlier studies (E. S. R., 77, p. 727), the authors report a study conducted on matched lots of rats receiving an adequate diet containing from 0.19 to 0.2 percent of calcium and from 0.4 to 0.43 percent of phosphorus to which additional amounts of calcium or calcium and phosphorus were added, and the effect upon growth and body weight was studied in the second generation. At a level of intake of 0.64 percent of calcium the animals showed a more rapid and efficient growth than was shown by the animals receiving the unsupplemented ration, and at an 0.8-percent level of calcium even greater growth was exhibited, accompanied by an improvement in the normal process of calcification.

Influence of the inorganic salts in the diet on the composition of the ash of certain tissues of the rat, E. S. Eppright and A. H. Smith (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 679–692*).—In continuation of previous studies by Swanson, Storvick, and Smith (E. S. R., 75, p. 881), six groups of male rats were maintained for 60 days on purified diets containing varying amounts and combinations of the inorganic salts, the amount given daily being calculated from the average intake of the rats on the low salt diet previously studied. Under ether anesthesia the animals were bled from the abdominal aorta, and tissue samples were removed, ashed, and analyzed for potassium, sodium, chlorides, and total lipids.

The authors observe that the potassium and sodium contents of muscle are influenced more by the calcium than by the potassium and sodium contents of the

diets, since a normal ratio of potassium : sodium was found when calcium was abundantly supplied and the other elements were restricted. In general a diminished potassium and augmented sodium accompanied a poor nutritional state. The chloride content varied directly with the level of chloride in the diet. The removal of calcium and phosphorus from the diet greatly reduced the lipids in the tissues and particularly in the skin.

Influence of salts in the diet on the intestinal flora of the albino rat, E. S. Eppright, G. Valley, and A. H. Smith (*Jour. Bact., 34 (1937), No. 1, pp. 81–97, figs. 4*).—Bacteriological examinations were made on the feces of six groups of rats maintained on a basal diet consisting of casein 18 percent, hydrogenated fat 27, and dextrin 55 percent, with vitamin supplements, and of one group in which the casein in the diet was replaced by low ash lactalbumin. Supplements of calcium, phosphorus, sodium chloride, potassium, calcium carbonate, and the Osborne and Mendel salt mixture complete and minus sodium chloride and potassium were fed daily. The procedure described above was followed.

On the low salt intakes the usual aciduric intestinal flora with *Lactobacillus acidophilus* was replaced by flora consisting mainly of organisms of the *Escherichia coli* and *Proteus* types and *Streptococcus fecalis*. The Osborne and Mendel salt mixture was effective in maintaining a flora high in *L. acidophilus* and in restoring the balance of bacillary adurics in the intestinal flora previously altered by the ingestion of a diet deficient in inorganic salts. The normal flora was not maintained by the addition of a calcium or phosphorus supplement alone. When sodium chloride and potassium were given, the *L. acidophilus* did not flourish in the intestinal flora, and upon their removal the lactobacillus did not disappear.

The lipid and mineral distribution in the serum and erythrocytes of normal children, B. N. Erickson, H. H. Williams, F. C. Hummel, and I. G. Macy (*Jour. Biol. Chem., 118 (1937), No. 1, pp. 15–35*).—In this investigation, which is one of several on the chemicophysiological changes coincident with growth and the transformation of the normal child from the period of variation and adjustment to that of mature stability, simultaneous analyses were made of the minerals and lipids in the blood plasma and cells of 21 normal preadolescent children, together with complete hematological observations and some physiochemical studies.

The findings indicate that the blood plasma is lower in lipid content during preadolescence than during adult life. The serum mineral content remains constant and similar to that reported for adults, while the minerals in the cells are more variable and appear to be more susceptible to environmental influences such as diet. The concentration of lipids in the cells of children is similar to that in adults. It is suggested that the concentration of minerals in the plasma may indicate the ability of the organism to maintain equilibrium in spite of changing structure and function, whereas the concentration of lipids in the plasma may indicate the progressive stages of development between infancy and maturity.

The lipid and mineral distribution of the serum and erythrocytes in the hemolytic and hypochromic anemias of childhood, B. N. Erickson, H. H. Williams, F. C. Hummel, P. Lee, and I. G. Macy (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 569–598, figs. 2*).—Following the procedure described in the paper noted above on normal children and using them for control subjects, simultaneous analyses were made on children with hemolytic (erythroblastic, sickle cell, and hemolytic icterus) and hypochromic anemia to determine the sodium, potassium, chloride, nitrogen, and complete lipid distribution in blood cells and plasma. The chemical studies were accompanied by hematological and physico-

chemical observations on the erythrocytes, such as cell volume, weight, diameter, thickness, specific gravity, water content, and resistance to hemolysis against saponin and hypotonic sodium chloride solutions. The chemical composition of the cells was calculated in terms of the mean concentration per single red corpuscle.

The most characteristic changes in the plasma lipid contents were found occurring in the neutral fat fraction, which shows a marked elevation in erythroblastic anemia, with lesser increases in the other types. More of the total lipid content in the form of free cholesterol occurs in all but erythroblastic anemia and hemolytic icterus before splenectomy. The percentage of phospholipids as absolute alcohol soluble in the plasma of hemolytic anemia is about the same or slightly higher and in hypochromic anemia is lower than that in normal children. The concentration of minerals in the serum is within the normal range for calcium, low for sodium, and variable for potassium. With the exception of hypochromic anemia the potassium : sodium ratio of the erythrocyte is decreased. The variations in the lipid and mineral contents of the erythrocyte appear to be dependent upon the type of anemia and to be related to the characteristic red blood cell typical of the anemia. The cells of erythroblastic, sickle cell, and hypochromic anemias are more discoidal and those of hemolytic anemia more spherical than normal. A correlation seems to exist between the shape and the fragility of the corpuscles in the hemolytic anemias.

The lipid and mineral distribution of the serum and erythrocytes in pernicious anemia, H. H. Williams, B. N. Erickson, S. Bernstein, F. C. Hummel, and I. G. Macy (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 599–618, figs. 2*).—In continuation of the paper noted above, this report presents hematological, chemical, and physiochemical observations made on the lipid and mineral distribution in the red cell and plasma of patients with pernicious anemia both before and after therapeusis.

The plasma lipids show an increased content of normal fat with a concomitant deficiency of cholesterol esters and phospholipid which returns to normal levels after therapy. The serum minerals are unchanged in pernicious anemia. Abnormalities occur in the erythrocyte minerals with sodium and potassium elevated during relapse and the potassium still elevated during the partial remission stage. The chloride content during relapse and partial remission is slightly higher than in complete remission or normal. In relapse the cell cation is increased out of proportion to the elevation of the cell anion, thus causing the formation of an excess of cations in partial and complete remission. The macrocyte of pernicious anemia is slightly more spherical than normal and a relationship exists between the degree of spherocity, the cell volume, and the corpuscular hemoglobin. Excessive amounts of cholesterol esters and deficiencies of phospholipid and free cholesterol in the red cells occur in a relapse of pernicious anemia. Following therapy the composition of the erythrocyte becomes normal, with subsequent improvement of the hematological and clinical picture upon complete remission.

Physiological and nutritional anemias of infancy, G. R. Alpert (*Arch. Ped., 54 (1937), No. 5, pp. 268–290*).—In this review article, the author discusses recent findings in the anemias of premature and full-term infants and their treatment by the therapeutic agents iron, copper, liver, and blood transfusion. "Prophylaxis of physiological anemia in infancy should be considered as a routine procedure for all infants."

Nutritional anaemia in the east end of London, L. Findlay (*Brit. Med. Jour., No. 3965 (1937), pp. 12, 13, figs. 2*).—Hemoglobin and red cell values were estimated from blood examinations made on 290 hospitalized children varying

in age from a few days to 14 yr. When the individual hemoglobin estimations for each month during the first year of life and for each year thereafter up to 14 yr. were charted, the general trend showed the high level present immediately after birth, the rapid fall during the early weeks of life but tapering off later, and the recovery during the late months of infancy which continues through childhood. During the first 3 mo. of life many infants showed abnormal hemoglobin values which were attributed to congenital causes or hemorrhage at birth. A few cases of anemia during later infancy and childhood were probably the result of the toxic condition of the subjects. Nutritional anemia is not common among these children, representing the poorest stratum of society.

Additional observations on the anemia caused by deaminized casein, A. G. Hogan, R. E. Guerrant, and W. S. Ritchie (*Jour. Biol. Chem., 115 (1936), No. 3, pp. 659–672, figs. 3*).—Further studies (E. S. R., 75, p. 889), at the Missouri Experiment Station indicated that the approximate amount of casein required to prevent anemia in rats was equivalent to 5 percent of the ration, while the minimum amount of deaminized casein required to produce anemia was from 5 to 10 percent of the ration. A miscellaneous group of substances, including milk, egg yolk, wheat germ oil, ventriculin, muscle, liver, and stomach, were ineffective when given in amounts of from 100 to 400 mg of dry matter daily. The anemic condition was not prevented or healed by the administration of laboratory preparations of lactalbumin, ovovitellin, and in most cases ovalbumin. Commercial preparations of lactalbumin and ovalbumin prevented the anemia consistently, as did 18 percent of dried yeast. Autoclaved casein and yeast were ineffective curative agents. The active agent was recovered in the hydrolysate when both casein and deaminized casein were hydrolyzed with 25 percent of sulfuric acid at atmospheric pressure.

Studies on the copper and iron content of tissues and organs in nutritional anemia, M. O. Schultze, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 93–106, fig. 1*).—In this contribution from the Wisconsin Experiment Station the site of action of copper in the formation of hemoglobin was studied in rats and young pigs made severely anemic on an exclusive milk diet. When the hemoglobin content of the blood was about 2 g per 100 cc some of the animals were killed and analyzed, while litter mates were fed purified iron daily as ferric chloride or copper as copper sulfate, or both, for a 7-day period. Copper determinations were made by the Fischer and Leopoldi method, total iron by a modification of the bipyridine method, and inorganic iron by the method essentially as described by Kohler et al. (E. S. R., 76, p. 582).

The feeding of copper and iron for seven days caused only a small retention of copper, although maximum hemoglogin formation resulted in the severely anemic rats. The results with young pigs suggest that these animals suffer from anemia due to lack of iron which responds to treatment with iron only when the body stores of copper are adequate during the first few weeks of life. Young pigs suffering from both iron and copper deficiency cannot form hemoglobin or erythrocytes when pure iron alone is supplied. Although hematopoiesis proceeded rapidly, the feeding of iron and copper to anemic pigs suffering from a deficiency of these minerals did not bring about an accumulation of copper in the distal ends of the ribs or in the liver and spleen. "Evidently it is impossible to localize the action of copper in the sense that failure of the anemic animal to regenerate is due to the fact that the copper concentration of any of the three organs mentioned is too low."

Studies on the copper content of the blood in nutritional anemia, M. O. Schultze, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 116 (1936), No.*

1, pp. 107–118, figs. 3).—In continuation of the study noted above, weekly copper analyses were made on a litter of young pigs, some of which had received small amounts of pure iron added to the milk diet in order to delay the onset of anemia. From these values and the cell volume the approximate copper content of the blood cells was calculated.

The copper content of the blood fell to extremely low levels in the pigs suffering from iron and copper deficiencies. A very rapid and significant increase of copper content resulted when from 2 to 4 mg of copper per day, together with iron, were fed. It is suggested that 20 μg of copper per 100 cc of blood is the minimum level necessary to insure rapid continuous hematopoiesis in young pigs. The study of the chemical changes in the blood during recovery from severe nutritional anemia appears to be the most promising approach toward an understanding of the functions of copper in blood formation.

Studies on the glutathione content of the blood in nutritional anemia, M. O. Schultze and C. A. Elvehjem (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 711–716*).—Data are presented on the reduced and total glutathione in the blood of stock rats, rats made anemic by milk feeding, and anemic rats after the administration for 5 days of 0.5 mg Fe and 0.1 mg Cu, alone and together.

In the anemic rats receiving no supplements and those receiving only iron or copper, the content of reduced glutathione was much lower than in the normal rats or anemic rats which had been given the iron and copper treatment for the short period of 5 days. In the normal rats the reduced form of glutathione accounted for from 90 to 100 percent of the total, while in the anemic rats it amounted to less than 50 percent of the total.

In similar experiments with pigs there was an increase of both total and reduced glutathione in the erythrocytes as the anemia became severe.

Sex variations in the utilization of iron by anemic rats, M. C. Smith and L. Otis (*Science, 85 (1937), No. 2196, pp. 125, 126*).—In an investigation of the hematopoietic value of foodstuffs by the method developed by Elvehjem and his coworkers (E. S. R., 73, p. 416), a marked difference in response between the male and female test rats was consistently noted. The Elvehjem and Kemmerer technic (E. S. R., 67, p. 90) of preparing the anemic rats was followed. Hemoglobin determinations were made on samples taken from the tail by comparison with a standard Newcomber plate in a Duboscq colorimeter. After from 4 to 5 weeks on the whole milk powder diet, at which time the hemoglobin level averaged 3.9 g per 100 cc of blood, varying amounts of iron supplements in the form of ferric chloride or contained in whole wheat, rolled oats, and dried lima beans and 0.05 mg of copper as copper sulfate and 0.04 mg of manganese as manganese chloride were given daily for 6 weeks. At least 10 rats of each sex were used on each level of iron intake.

The results show that hemoglobin regeneration was greater in the females than in the males fed at the same level of iron intake up to 0.2 mg, above which the intake was large enough to promote maximum hemoglobin development in all the rats so that the difference between the sexes was less apparent.

"Whatever is the explanation of this greater hemoglobin regeneration in anemic female rats as compared with males, it is the authors' belief that ignorance of this fact may explain some of the discrepancies of the same magnitude in the findings in various laboratories relative to the availability of iron in foodstuffs."

Sex differences in anemic rats, H. H. Mitchell and T. S. Hamilton (*Science, 85 (1937), No. 2206, pp. 364–366*).—The authors present experimental evidence on the question as to whether the sex differeuce reported by Smith and Otis in the paper noted above and by H. S. Mitchell (E. S. R., 68, p. 712) is a primary difference in iron or copper metabolism or is merely a sequel of a primary dif-

ference in growth impulse. A series of experiments are presented in which rats were paired according to initial weight and hemoglobin concentration of the blood with animals of the same or opposite sex. One rat in each pair received milk solids ad libitum and the pair mate received two-thirds as much as was voluntarily consumed by the other rat. Varying amounts of iron and copper supplements were fed in equal daily doses to each pair.

The results show that 0.2 mg of iron with 0.02 mg of copper promoted a more rapid regeneration of hemoglobin in rats maintained on the smaller intake of milk solids, and after 2 weeks of feeding a difference of approximately 2 g per 100 cc of blood developed. When the iron and copper supplements were administered in the amounts of 0.5 and 0.05 mg, respectively, the differences in hemoglobin regeneration between rats of the same or of opposite sex were less apparent. "It may be concluded that the sex difference in the development of nutritional anemia noted by H. S. Mitchell, as well as that in the recovery from nutritional anemia noted by Smith and Otis, may be partially or entirely the result of a greater intake of the anemogenic basal diet by male rats."

Hemoglobin regeneration in anemic rats in relation to iron intake, M. C. Smith and L. Otis (*Jour. Nutr., 13 (1937), No. 6, pp. 573–582, fig. 1*).—In this paper, which is essentially noted above, the authors suggest modifying the bio-assay method developed by Elvehjem and his coworkers (E. S. R., 71, p. 130) and later modified by them (E. S. R., 73, p. 416) for the determination of the available iron in foods by comparing the gains in hemoglobin regeneration shown by anemic rats fed a food source of iron with those of litter mate anemic rats given the same amount of iron as ferric chloride at levels below 0.2 mg daily and preferably in the range of 0.03–0.15 mg. By so doing, smaller differences in iron availability may be detected, as the hemoglobin response per unit weight of iron fed is greater when less than 0.3 mg is given. Comparisons of iron availability should be confined to rats of the same sex. During preparation of the anemic rats the iron reserves should be depleted in the presence of sufficient copper so that the hemoglobin response in the test animals would be a measure only of the utilization of iron.

Graphic curves are presented which show the hemoglobin gains resulting from daily feeding of iron in a completely available form at different levels to male and female anemic rats, and may be used to determine the amount of available iron in a given food supplement if the hemoglobin gain resulting from the daily feeding of the food is known.

The content of available iron in 13 foodstuffs, as determined by bio-assay, is given, and except for 4 foods agrees closely with the values obtained by the dipyridine method. It is suggested that the lower percentage availability of iron in apricots, raisins, cabbage, and dates, when determined by bio-assay, may be due to their relatively high roughage content, which serves as a mechanical obstruction to the absorption of the iron.

Vitamins in theory and practice, L. J. Harris (*New York: Macmillan Co.; Cambridge, Eng.: Univ. Press, [1937], 2. ed., XIX+242, figs. 66*).—The first edition (E. S. R., 75, p. 425) has been brought up to date by adding material on "the more significant advances which have been made during the year since the appearance of the first edition—the chemical characterization of vitamin B_1, the isolation of vitamin E, and the recognition that 'vitamin B_2' is a complex consisting of at least three factors."

***Effects of prolonged chronic vitamin A deficiency in the rat with special* reference to odontomas,** A. U. Orten, C. G. Burn, and A. H. Smith (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 1, pp. 82–84*).—A chronic vitamin A deficiency of long duration was produced in rats by the withdrawal of the vitamin A from the mother's diet before the young were 13 days old, and when

the young reached 21 days a purified vitamin A-free ration was fed until the beginning of weight decline, the first stages of xerophthalmia, or the continued excess cornification of the vaginal epithelium of the female rats appeared, whereupon a small quantity of vitamin A in the form of cod-liver oil was given by mouth. The daily allowance of vitamin A, which depended upon the clinical state of each rat, varied from 0.7 to 6 international units, the dose being increased progressively throughout the experiment.

The most startling and consistent effect of the chronic deficiency was found in the incisor teeth, which showed progressively a loss of the normal orange pigment, the development of opacity, a distortion of shape, and eventual exfoliation of the erupted portion, with histological changes similar to those observed by Wolbach and Howe (E. S. R., 70, p. 725). The majority of the animals surviving 365 days on the diet developed tumor growths arising from the pulp of the incisor teeth. Otitis media, sinusitis, and congested nares were commonly observed.

The influence of lack of vitamin A in the diet on the phagocytosis promoting properties of the blood serum, E. Gellhorn and J. O. Dunn (*Jour. Nutr., 13 (1937), No. 3, pp. 317–328, fig. 1*).—Experiments were carried out on 57 vitamin A-deficient and 22 control rats, with the phagocytic index determined by the Hamburger method which is described in detail.

Both increases and decreases in the normal phagocytic index were shown by the vitamin A-deficient rats. This is attributed to the fact that the infectious processes which occur under vitamin A deficiency elicit the production of antibodies to an increased degree during the earlier state of the deficiency, but later the production of the antibodies does not keep pace with the demands of the organism and so the phagocytic index decreases and the animal is rendered more susceptible to infection. Vitamin A does not seem to be indispensable for the production of antibodies. Weight loss and severity of symptoms do not parallel the phagocytic index changes, and these changes completely reverse when the vitamin A-deficient animals are placed on a normal diet for a sufficient length of time.

The determination of vitamins B and G in human urine by the rat-growth method, O. M. Helmer (*Jour. Nutr., 13 (1937), No. 3, pp. 279–286, fig. 1*).—In continuation of a previous study (E. S. R., 74, p. 132), the author describes a simplified method for preparing human urine supplements by means of adsorption of the vitamins B and G on Lloyd's reagent, and reports the results of determinations made on urine samples obtained from five subjects which were tested for vitamins B and G activity by the rat-growth method. The method is similar to the technic described by Harris and Leong (E. S. R., 76, p. 425).

The results agree with those of Harris and Leong, with acid clay used for the adsorption of vitamin B, and the bradycardia method of Harris, which has the advantage of requiring less urine for the test, and with the results reported previously by the author and by Roscoe (E. S. R., 76, p. 885) that vitamin G or flavine is excreted in normal urine. The urine samples tested contained larger amounts of vitamin G than of vitamin B.

A study of the effect of vitamin B and iodine on the weight, iodine content and structure of the thyroid gland of the rat, M. D. Carpenter and G. R. Sharpless (*Jour. Nutr., 13 (1937), No. 3, pp. 235–247, figs. 4*).—This study was conducted on male and female animals divided into three groups and maintained on well-controlled purified diets at different levels of iodine intake for 41, 82, and 123 days, respectively, with the latter two groups also receiving yeast supplement. Iodine determinations were made on the diet materials and on one lobe of the thyroid of each rat. The hypophyses were also weighed, since a relationship is known to exist between the hypophysis and the thyroid.

The results suggest that some factor present in yeast, which is not destroyed by autoclaving and which is not supplied by a vitamin B-containing extract, causes an increase in the iodine content and concentration of the thyroid. The rats receiving the vitamin B-deficient diet containing 0.0038 percent of iodine developed a thyroid gland that microscopically simulated colloid goiter, while the rats on the same diet containing 0.019 percent of iodine or vitamin B failed to develop this condition. The differences in the weights of the hypophyses of the rats were not statistically significant.

On the fractionation of the vitamin B_2 complex from various source materials, N. Halliday and H. M. Evans (*Jour. Biol. Chem., 118 (1937), No. 1, pp. 255–267, fig. 1*).—The authors studied the extent of the influence of the "filtrate factor" of Lepkovsky et al. (E. S. R., 76, p. 839) in tests for vitamin B_6. The basal diet (787–B) contained 8 percent filtered butterfat and 68 percent of cornstarch, and in diets 793 and 794 the butterfat was reduced to 3 percent and 73 percent of sucrose replaced the cornstarch. The casein for diets 787–B and 793 was extracted four times with boiling 95 percent alcohol, twice with cold 60 percent, and once with cold 95 percent alcohol for 24 hr. each. In diet 794 the casein was washed for 1 week in acidulated water, dried, and extracted continuously for 1 week with 70 percent alcohol. All test materials were prepared in a darkened room and stored in dark bottles. The relative vitamin B_6 potency of the following materials was determined: Brewers' yeast preparations (*irradiated and nonirradiated*), *fresh and dried liver preparations*, *wheat germ* oil, hepatoflavine, whole wheat preparations, rice bran filtrate, and the Lepkovsky-Jukes filtrate factor concentrate.

During the depletion period the basal diet was supplemented by vitamin B_1 only, and in from 4 to 5 weeks for diet 787–B and from 3 to 4 weeks for diets 793 and 794 the growth ceased and mild dermatitis developed. The experimental results for a 4-week period are reported. The dermatitis symptoms were scored from 1+ to 4+, denoting progressive changes from a mild condition and no signs of growth to the final stage in which the rats had lost from 10 to 20 g in weight and exhibited rawness about the mouth and nose, closed eyes, edematous condition of the feet and forelegs, and bloody urine. It was assumed that the *presence of the filtrate factor separated from vitamin B_6 is indicated by induced* growth without protection from dermatitis. Applying these criteria to the data presented, the following observations are made:

The liver extract of Lepkovsky and Jukes contains no vitamin B_6, but is a good source of the filtrate factor. Fractions prepared from whole wheat and from liver stimulated growth without protecting the rats from dermatitis. The vitamin B_6 was almost completely recovered from eluates of liver and whole wheat preparations after adsorption. The vitamin B_6 activity was not completely removed from the rice bran extract after four adsorptions. The growth-promoting activity of vitamin B_6 in the liver filtrate was slightly lowered by autoclaving at pH 9 for 1 hr. and was lost by storage in the cold. Both the *vitamin B_6 and the filtrate factor* can be *dialyzed*. No *vitamin B_6 activity* was found in wheat germ oil nor destruction of any factor present in brewers' yeast extract after 10 hr. of irradiation. "It would seem that an eluate from dialyzed freshly prepared liver filtrate or from whole wheat extract would be a promising source material to be used for further work in concentrating vitamin B_6." The conclusions of Lepkovsky and Jukes regarding the growth-stimulating action of the filtrate factor are confirmed.

Dietary production of the syndrome of deficiency in vitamin B_6, N. Halliday and H. M. Evans (*Jour. Nutr., 13 (1937), No. 6, pp. 657–667, fig. 1*).—In addition to the findings noted previously from a preliminary report (E. S. R., 75, p. 728), the authors describe tests made on rats after modifying the car-

bohydrate and fat contents of the original Sherman-Spohn diet to give the experimental diet 787–A which contains sugar in place of cornstarch, and diets 787–B, 793, and 794, referred to in the abstract preceding this.

It is concluded that diets 793 and 794, which are high in sucrose, low in fat, and contain casein extracted with both boiling 95-percent alcohol and cold 60-percent alcohol, can be depended upon to induce the syndrome of vitamin B_6 deficiency with regularity and uniformity. A system of scoring symptoms is presented which permits quantitative comparison of the animals in the various groups.

A new essential dietary factor, C. A. Elvehjem, C. J. Koehn, Jr., and J. J. Oleson (*Jour. Biol. Chem., 115 (1936), No. 3, pp. 707–719, figs. 3*).—In this contribution from the Wisconsin Experiment Station the authors describe an essential dietary factor which is distinct from the known dietary essentials. The method followed in the concentration of this alcohol-ether precipitate factor from liver extract and its distribution and identity are discussed. Evidence is advanced to show that the factor is distinct from the vitamins B_1, B_2, B_4, B_6, and flavine and is neither an amino acid nor choline. The factor occurs in liver, yeast, and milk and is water-soluble, insoluble in the fat solvents, labile to autoclaving, and adsorbed on charcoal. When the factor was omitted from the diet of experimental rats the rats failed to grow, a point which should be considered when any attempt is made to produce pellagra in the rat.

Vitamin-C content of vegetables.—V, Cabbage, S. Gould, D. K. Tressler, and C. G. King (*Food Res., 1 (1936), No. 5, pp. 427–434, figs. 2*).—In continuation of the series of studies at the New York State Experiment Station (E. S. R., 77, p. 151), data have been obtained on the effect of variety, cooking, storage, and refrigeration after cooking on the vitamin C content of three varieties of early and three of late cabbage. The titration method was used throughout, following the technic of Mack and Tressler as described on page 154, and the results were confirmed by 14-day curative tests on guinea pigs. The cooking method was substantially that of Halliday and Noble.

The three early varieties tested, Golden Acre, Early Copenhagen, and Peerless, were much higher in ascorbic acid, 0.55, 0.55, and 0.56 mg per gram than the three later varieties, Late Copenhagen Market, Glory, and Danish Ballhead, 0.26, 0.3, and 0.3 mg per gram, respectively. Whole heads of cabbage of the Glory variety lost ascorbic acid during storage, the losses being more rapid the higher the temperature. At the end of 42 days of storage at room temperature the value had dropped from 0.32 to 0.21 mg per gram, while it required 84 days for cabbage stored just above freezing to reach this value.

During the cooking of the cabbage about one-fourth of the original vitamin C content was lost in the first few minutes, after which the loss was very slight, although there was a gradual transfer of the vitamin from the cabbage to the cooking water. Losses in the cooked cabbage continued on storage even in very cold refrigerator temperature, 1°–3° C. The losses amounted to somewhat over 50 percent after 48 hr. It is suggested that the catalytic effect of copper or hemochromogen-like substances might account for the oxidation, as suggested by Barron, DeMeio, and Klemperer (E. S. R., 75, p. 741).

TEXTILES AND CLOTHING

A portable ultra-violet fluorescence lamp for the examination of textile and other materials, D. A. Derrett-Smith (*Jour. Textile Inst., 28 (1937), No. 5, pp. T145–T160, pls. 4*).—The lamp described has an ultraviolet radiation of from 3,000 to 4,000 a. u. and has been successfully used in the examination of

fabrics impregnated with different oils, fats, and waxes, in the determination of the depth of dyeing in yarns and fabrics, and for the detection of mildew and metallic soap stains.

The demand for textile fabrics for various purposes, J. V. COLES (*Missouri Sta. Bul. 387 (1937), pp. 69, 70*).—In this progress report data are given on the character of the demand for window curtains, blankets, sheets, towels, women's dresses, and hosiery.

HOME MANAGEMENT AND EQUIPMENT

[Home management studies by the Illinois Station] (*Illinois Sta. Rpt. 1936, pp. 297–306, fig. 1*).—This progress report deals with a continuation of the analysis of 216 farm and 62 town family records in a study on planned spending and of 84 farm family record books for the period of 1932–35 to show changing consumer habits, by R. C. Freeman.

MISCELLANEOUS

Yearbook of Agriculture, 1937, H. A. WALLACE ET AL. (*U. S. Dept. Agr. Yearbook 1937, pp. [8]+1497, figs. 335*).—This contains The Secretary's Report to the President (pp. 1–116), previously noted (E. S. R., 76, pp. 617, 667, 698, 732); and Better Plants and Animals, II, noted elsewhere in this issue and discussed editorially (E. S. R., 77, p. 737).

A year's progress in solving farm problems of Illinois: [Forty-ninth Annual Report of Illinois Station, 1936], compiled and edited by F. J. KEILHOLZ (*Illinois Sta. Rpt. 1936, pp. 333, figs. 47*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Science points the way: Work of the [Missouri] Agricultural Experiment Station, [1936], E. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 387 (1937), pp. 121, figs. 9*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Fifty-seventh Annual Report of the North Carolina Agricultural Experiment Station, [1934], R. Y. WINTERS ET AL. (*North Carolina Sta. Rpt. 1934, pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Data are included on the cost of production of cotton, tobacco, and potatoes, by R. E. L. Greene (pp. 27, 28), and of eggs (p. 58), and on factors influencing the commercial manufacture of cucumber pickles, by I. D. Jones (pp. 69, 70).

The first fifty years of the Oregon Agricultural Experiment Station, 1887–1937 (*Oregon Sta. Circ. 125 (1937), pp. [28], figs. 108*).—This account includes a chronology by J. C. Burtner, a pictorial summary of 15 outstanding achievements of the station and a number of the current research projects, and data pertaining to the substations.

History of the first quarter of a century of the agricultural experiment station at Rio Piedras, Puerto Rico, M. T. COOK, J. I. OTERO, F. A. LÓPEZ DOMÍNGUEZ, ET AL. (*Puerto Rico Col. Sta. Bul. 44 (1937), pp. 123, pl. 1, figs. 18*).—This is a review of the history and work of this station, including a list of its publications.

Fiftieth Annual Report [of Vermont Station, 1937], J. L. HILLS (*Vermont Sta. Bul. 425 (1937), pp. 34*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Herd improvement data are also included (pp. 17, 18).

NOTES

Arizona University.—A permanent laboratory is projected to continue the work under way for many years by Dr. A. E. Douglass on the relationship between tree rings and climatic cycles. This laboratory will be under the direction of a board consisting of Drs. Douglass, E. Haury, and Edwin F. Carpenter, who will seek to work out a system of classifying data from more than 10,000 observations.

Georgia Coastal Plain Station.—Plans for the erection by the U. S. Department of Agriculture of a greenhouse to cost $4,000 are under way.

Idaho Station.—About 62 percent of the bean acreage of the State is now planted to strains of the Great Northern variety developed by the station. An estimated increase in yield of 65 percent is predicted from the use of these strains, which at current prices would yield to the growers an increased income of approximately $4,000,000 per annum.

Kansas College and Station.—Dr. H. F. Lienhardt, associated with the veterinary work of the institution since 1917 and since 1920 head of the department of veterinary medicine and pathologist of the station, died November 11, 1937, at the age of 43 years. A native of Pennsylvania, he received the D. V. M. degree from the University of Pennsylvania in 1916. He served in the U. S. Veterinary Corps in 1918–19.

F. G. Parsons, assistant in cooperative experiments, resigned November 30, 1937, to accept a position in the department of agronomy in the University of California at Davis and has been succeeded by H. D. Hollembeak.

Michigan Station.—O. B. Winter, research associate in chemistry since 1919 and, aside from a brief service in 1911 and 1912 as assistant chemist in the New York State Station, continuously associated with the chemical work in Michigan since 1910, died October 1, 1937, aged 58 years. He was a native of the State and received the B. S. degree from the University of Michigan in 1909 and the M. S. degree in 1930. He was an outstanding authority on the analysis of plant materials.

Nevada Station.—A constant-temperature room for investigations of nutrient availability by the Neubauer method, with a capacity of several hundred cultures, is being installed in the soils research laboratory.

Puerto Rico Station.—David W. May, director from 1904 until his retirement in 1930, died at Benton City, Mo., December 12, 1937. Born in Platte County, Mo., on April 22, 1868, he received from the University of Missouri the B. Agr. degree in 1894 and the M. Agr. degree in 1896 and served as assistant agriculturist in charge of field experiments in the Missouri Station from 1896 to 1899. He was then employed by the Office of Experiment Stations until 1901, when he became animal husbandman in the Kentucky Station. In 1917–18 he was associated with *Experiment Station Record* in connection with the abstracting in animal husbandry and dairying. His services in Puerto Rico have been discussed editorially (E. S. R., 62, p. 601).

Clemson College and South Carolina Station.—Dr. Richard N. Brackett, said to have been the last surviving member of the original faculty, died November 27, 1937, at the age of 74 years. Dr. Brackett was a graduate of Davidson

College in 1883 and received the Ph. D. degree from Johns Hopkins University in 1887. After 4 years as chemist of the Arkansas Geological Survey, he went to Clemson in 1891 as associate professor of chemistry and assistant chemist. In 1908 he relinquished his station connection but continued his college duties until 1923 and subsequently served as lecturer in chemistry. He was also for 23 years State chemist in charge of fertilizer inspection. He was prominent in the Association of Official Agricultural Chemists, serving as president in 1916.

Texas Station.—Dr. J. J. Taubenhaus, chief of the division of plant pathology and physiology since 1916, died December 13, 1937, aged 53 years. Dr. Taubenhaus was born in Palestine, becoming an American citizen in 1908. He received the B. S. and M. S. degrees from Cornell University is 1908 and 1909 and the Ph. D. degree from the University of Pennsylvania in 1913, and served as associate plant pathologist in the Delaware Station from 1909 to 1915. He had worked especially with diseases of vegetable crops and cotton and was widely known for his contributions in these and related lines.

Vermont Station.—A State appropriation of $5,000 per annum has been made for research in horticulture, with special reference to orchard practice. This will include soil management and maintenance of fertility, winter injury and its relation to orchard practices, control of insect pests and fungus diseases, orchard management, and marketing methods.

West Virginia University and Station.—Dean and Director F. D. Fromme resigned February 1 to accept an appointment in the Office of Experiment Stations with the rank of principal experiment station administrator. In his stead Dr. C. R. Orton, head of the department of plant pathology and forestry, has been appointed dean of the College of Agriculture, Forestry, and Home Economics and director of the station, and J. O. Knapp, assistant director of agricultural extension, has been designated acting director of extension.

American Society of Agronomy.—This society held its thirtieth annual meeting in Chicago from November 30 to December 3, 1937, with a registration of 713. The address of President F. D. Richey was entitled Why Plant Research, dealing with reasons for its continuance and what it may be expected to accomplish.

The officers for the ensuing year include the following: President, Emil Truog; Vice President, R. J. Garber; chairman of crops section, Ide P. Trotter; chairman of the soils section and president of the Soil Science Society of America, A. M. O'Neal; secretary-treasurer, F. B. Smith, Gainesville, Fla.; editor, J. D. Luckett; and members of the executive committee, F. D. Richey and R. M. Salter. W. A. Albrecht, Columbia, Mo., was elected secretary of the Soil Science Society. The fellows elected were O. S. Aamodt, W. A. Albrecht, F. E. Bear, H. O. Buckman, G. W. Conrey, H. D. Hughes, F. D. Keim, R. D. Lewis, J. D. Luckett, and H. L. Westover.

Rural Sociological Society of America.—This society was organized December 29, 1937, at Atlantic City, N. J., with the following officers for the ensuing year: President, Dwight Sanderson; vice president, J. H. Kolb; secretary-treasurer, T. Lynn Smith, Baton Rouge, La.; and additional members of the executive committee, C. E. Lively and C. C. Taylor. A research committee, consisting of C. Horace Hamilton, chairman, Harold Dorn, and N. L. Whetten, was appointed, as well as a teaching committee, consisting of Wilson Gee, chairman, O. D. Duncan, and C. R. Hoffer, and an extension committee with J. P. Schmidt, chairman, Mary E. Duthie, and T. L. Vaughan. The society will carry on the *Journal of Rural Sociology* and will also undertake the publication of a series of rural sociological monographs.

EXPERIMENT STATION RECORD

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THE 1937 REPORT OF THE CHIEF OF THE OFFICE OF EXPERIMENT STATIONS

During the fiscal year ended June 30, 1937, the administrative functions and responsibilities of the Office of Experiment Stations were considerably enlarged and extended by the administration of $1,200,000 of additional research funds made available to the experiment stations and the Federal Department of Agriculture under the Bankhead-Jones Act. The report of the Chief of the Office for this period gives special prominence to these developments, and many of his findings on this and other matters are of general interest.

It may be recalled that under the terms of the Bankhead-Jones Act a special research fund is set up, half for special research projects of the Department and the remainder for the establishment and maintenance of research laboratories for the major agricultural regions. The sum available for this purpose in 1937 was $784,000. As the agency responsible for the administration of the fund, the Office cooperated in the further development of the three regional laboratories established during the previous year and in the selection of projects and development of plans for three additional laboratories, as well as in the program of the 34 special research projects which were active during the year.

All of the regional laboratories already set up (E. S. R., 75, p. 1) made distinct progress. At Charleston, S. C., the laboratory to develop improved varieties of vegetable crop plants having superior adaptation to the southeastern region of the United States was in active operation. At the end of the year laboratory buildings, greenhouses, a superintendent's residence, and other structures had been completed and were in use. About 170 acres of land had been made ready, and plant materials to serve for research in breeding and improvement of vegetable crop plants had been assembled. Over 700 strains of cabbage, cauliflower, and related plants, over 300 accessions of watermelons, and several hundred strains of tomatoes, beans, and peas were grown and tested for tolerance to weather conditions and diseases.

The second regional laboratory, devoted to research into the industrial utilization of the soybean and soybean products and located at the University of Illinois under the leadership of the Bureau of Chemistry and Soils, secured laboratory space, assembled equipment and other facilities, appointed a staff, and developed satisfactory relationships with the 12 experiment stations of the north-central region. While the physical plant was being developed, the Bureau of Plant Industry, in cooperation with 5 State experiment stations, grew more than 500 samples of seed in 5 States to study the effect of varietal, soil, fertilizer, and climatic factors on the chemical constituents of the soybean. Over 150 samples of 9 varieties of soybeans were analyzed.

Under the regional laboratory project for pasture improvement in the Northeast, located at State College, Pa., major attention was given to the completion of the physical plant, including the laboratory, the assembling and installation of equipment, the selection of research personnel, and development of the research program and relationships with the directors of the Northeastern States. The Pennsylvania Experiment Station assigned for the use of the laboratory 40 acres of land for nursery plantings, plat experiments, breeding work, and other purposes. Over 30,000 seedlings, including some 16 species, were grown in the greenhouse and transplanted to the nursery as a beginning for the research work.

One of the three additional regional laboratories took form at the Alabama Polytechnic Institute, where it is being devoted to research to develop methods of control for diseases and parasites of domestic animals in the southeastern region. The State of Alabama, through the institute, deeded to the Department approximately 40 acres of land as a site for the laboratory. Plans and specifications for the buildings and improvements were approved and contracts awarded for construction before the close of the fiscal year.

Following joint consideration by the directors of the 13 North Central States and representatives of the Department, a regional laboratory project for the improvement of swine through breeding methods was approved for this region. Active participation was formulated and agreed upon with the State experiment stations of Iowa, Nebraska, Missouri, and Minnesota. These States are to furnish land and swine, and by joint agreement the laboratory headquarters were located at the Iowa State College, where physical plant facilities will be available which would be difficult to secure in any other way.

A laboratory for the improvement of sheep for western ranges through the application of breeding methods was agreed upon in cooperation with the directors of the 11 western range States and

Texas. This laboratory is located at Dubois, Idaho, in conjunction with the facilities the Department has already established there. The research program and cooperative relationships agreed upon provide for coordination of the research of the laboratory with that of the State stations and the Department under regular funds. Plans and specifications for the laboratory and other necessary improvements were approved before the end of the year and contracts awarded for construction of the major units.

The report emphasizes the fact that in the selection of these new laboratory projects and in the planning of the research program the Department has had the wholehearted, active interest and help of the State stations. "While it is too early for conclusions as to the effectiveness of projects thus organized for coordinated attack on problems of regional or national significance, the plans would seem to be logical and promising of most effective results with a minimum of additional cost for the kind and scope of research undertaken. Considering the many agencies involved in the coordinated attack and the comprehensive problems undertaken, the progress in the development of the regional laboratory program would seem to be highly satisfactory."

Meanwhile, the work of the individual State experiment stations under the Bankhead-Jones appropriation was organized into 511 projects, of which 178 were new and 16 revised. The stations also carried on 487 Adams fnnd projects and 1,621 Purnell fund projects in addition to their activities under the Hatch fund and other resources. Special mention is made in the report of the progress in Hawaii and Puerto Rico, the former largely in the direction of a more diversified agriculture and the latter designed both to improve the agriculture in the island and to aid as a tropical outpost station in projects of benefit to the agriculture of the continental United States.

In expanding a cooperative-coordinated attack in research, all the stations continued to work closely with other State agencies and local organized groups, with each other in regional groups, and with this Department individually and in regional and national groups. In carrying out its functions, this Office examined, approved, and recorded nearly 1,200 new or revised formal cooperative research projects between bureaus of the Department and the State experiment stations. These covered nearly 1,000 major research undertakings. All of the State agricultural experiment stations and all but one of the research bureaus of the Department again participated. There were also many informal cooperative agreements between organized regional and national groups of stations, and in some cases between such groups and this Department. Some of these informal under-

takings were of major importance to specialized phases of agricultural production and rural life and were gradually assuming formal *status*.

Among other activities of the Office, reference is made to the status of *Experiment Station Record*. This publication, with a staff including on a whole time or part time basis practically all of the specialists in the Office, completed volumes 75 and 76, containing 3,343 and 3,501 abstracts, respectively, and in addition the customary editorials, news notes, and indexes. The compilation of a sixth general index, covering volumes 61–70, has already been referred to (E. S. R., 77, p. 579).

The number of abstracts published in the *Record* during the year was slightly larger than in 1936, but it is noted that the steady increase in the literature resulting from the continued development of agricultural research intensified an already acute problem as to selection of material. "When the present space limits of 1,800 printed pages were adopted in 1911, the aggregate income of the State experiment stations was less than $4,000,000 and their scientific staffs numbered less than 1,600 workers. In 1936 their staffs had increased to over 3,800 and their aggregate revenue to over $16,000,000. The station output in publications has likewise increased tremendously, partly in the stations' own series but even more largely through scientific journals. Other research agencies in the field of agriculture and home economics, including the Federal Department of Agriculture, have shown a similar increase in activity, and such subjects as agricultural economics, rural sociology, agricultural engineering, genetics, and home economics have made practically their entire development during the past quarter of a century.

"Under these circumstances the policy followed was that of a relatively complete review of all publications by experiment station and Department workers and the utilization of the remaining space largely on a basis of potential usefulness to these groups. Despite a more rigid selection than at any previous period, at the close of the year material sufficient for at least two additional issues was awaiting publication for which no space was available. With depression cuts in State appropriations being restored and the crest of the Bankhead-Jones Act funds still ahead, it has become increasingly evident that considerable enlargement of space will be essential if existing policies are to be maintained."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical investigations of the Puerto Rico College Station**], R. ARROYO (*Puerto Rico Col. Sta. Rpt. 1936, pp. 26–33*).—This report notes studies on an improved method of rum manufacture, the preparation of high grade alpha-cellulose from sugarcane foliage and bagasse by a method particularly adaptable to Puerto Rican conditions, varieties of cassava roots from an industrial standpoint, the industrialization of sugar factory filter cake, and the canning of coconuts and papayas.

Gmelin's handbook of inorganic chemistry.—IV, Nitrogen, pt. 4 (*Gmelins Handbuch der anorganischen Chemie. System-Nummer 4: Stickstoff. Lief. 4. Berlin: Verlag Chem., 1936, 8. ed., No. 4, pt. 4, pp. XVIII+N855–N1038+XXII, figs. 16*).—The fourth part of the section on nitrogen in the present edition of this well-known handbook, parts of which have already been noted (E. S. R., 75, p. 581), deals with the following compounds: Nitroxyl, dihydroxylamine, hydroxylamine, nitrohydroxylamine, nitrosohydroxylamine, nitroamide, nitrosoamide, hydronitrous acid, hyponitrous acid, nitrous acid, pernitrous acid, nitric acid, pernitric acid, and other compounds of nitrogen, oxygen, and hydrogen.

Gmelin's handbook of inorganic chemistry.—XXXV, Aluminum, Sect. A, pt. 5 (*Gmelins Handbuch der anorganischen Chemie. System-Nummer 35: Aluminium. Teil A, Lief. 5. Berlin: Verlag Chem., 1937, 8. ed., No. 35, Sect. A, pt. 5, pp. A683–A886, figs. 108*).—The part here noted deals with alloys of aluminum with metals from zinc to uranium.

Chemical investigations of the tobacco plant.—VI, Chemical changes that occur in leaves during culture in light and in darkness, H. B. VICKERY, G. W. PUCHER, A. J. WAKEMAN, and C. S. LEAVENWORTH (*Connecticut* [*New Haven*] *Sta. Bul. 399 (1937), pp. 753–832, figs. 33*).—Extending a research of which a number of results have already been noted (E. S. R., 74, p. 151), the authors have now subjected approximately equal samples of fully developed leaves of the tobacco plant to culture in water, in dilute glucose, and in dilute nutrient salt solution, both in continuous light and in the dark, and determined many of the chemical changes occurring under these conditions.

"Synthesis of organic solids in very considerable amounts occurred in light. Decomposition of organic solids into volatile products (water and carbon dioxide chiefly) occurred in the dark. The newly synthesized organic solids in the light experiments appeared to be mainly water-soluble, there being little change in the water-insoluble solids.

"Imbibition of water occurred in each case except in the culture on salt solution in the light. In several cases this resulted in guttation of water from the lower surface of the leaves. The excess of water was retained for approximately 100 hr., but subsequently, with the onset of chlorophyll degeneration, the water-holding capacity diminished and the leaves rapidly lost weight.

"Digestion of protein with the production of amino acids proceeded rapidly and at approximately the same rate for 72 hr. in all experiments. Later, the

rate of digestion diminished in the leaves cultured in light but was maintained in the leaves cultured in the dark. Corresponding with the digestion of the protein, there was an increase in the quantity of water-soluble nitrogen, and the composition of the water-soluble fraction underwent material change. These changes have chiefly to do with the amide metabolism of the leaves. Ammonia accumulated in notable amounts toward the end of the experiment in the leaves cultured in the dark, but there was only a moderate increase in free ammonia in the leaves in the light. The synthesis of the two amides, asparagine and glutamine, appears to be closely associated with this behavior. Very considerable amounts of asparagine accumulated during dark culture, but the amount of glutamine formed was small. On the other hand, both amides were rapidly synthesized in the light, the quantity of glutamine appreciably exceeding that of asparagine. The total amide synthesis at any point in light was materially less than the total amide synthesis in the dark. . . .

"With respect to the source of the ammonia, it is shown that the total nitrogen of the two amides may have arisen from ammonia produced in two ways. If it is assumed that oxidative deamination of amino acids occurred, and that reduction of nitrate to ammonia likewise took place, the whole of the nitrogen of the amides, together with the excess of free ammonia, can be accounted for from the disappearance of amino nitrogen of amino acids derived originally from the protein by enzymatic digestion and from the disappearance of nitrate nitrogen. The sums of the two respective quantities agree within the experimental error. The data, therefore, support the ammonia detoxication view of the origin of amides and account with some accuracy for the actual quantities of amides produced. . . .

"The total organic acidity of the tissues changed but little during culture, there being evidence for a slight increase in light and a slight decrease in the dark. The oxalic acid content also remained essentially constant throughout. Although both malic and citric acids remained constant during culture in light, the quantity of malic acid diminished very rapidly in the dark, the change being one of the most extensive in terms of actual quantity of substance involved that has been noted. Contemporaneously with the rapid decrease of malic acid, there was an increase in citric acid of equivalent significance. The evidence points to a direct or indirect conversion of malic to citric acid under these conditions. . . .

"Both fermentable sugar and unfermentable carbohydrate were synthesized throughout the period of culture in the light, although both disappeared fairly completely from the tissues during culture in the dark. The total quantity of carbohydrate synthesized accounts, however, for considerably less than the total increase in organic solids, and it is inferred that a substantial part of the newly synthesized products of photosynthesis were converted into other and nonreducing metabolites."

Observations on the variations in cyanogenetic power of white clover plants, C. F. Rogers and O. C. Frykolm (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 7, pp. 533–537*).—In an investigation reported upon in this contribution from the Minnesota Experiment Station "to determine the cyanogenetic property of white clover (*Trifolium repens*), from 1 to 5 individual tests were made on 513 different white clover plants. In all, 1,983 separate tests were performed . . ., of which about two-thirds were negative.

"Approximately 40 percent of the plants tested three or more times were consistently negative. Only 10 percent of the plants tested three or more times were consistently positive, and these were usually strongly positive. There is an indication of increase in the cyanogenetic power of plants with

increase in size of plant, with progress of season, and with a generally decreased moisture supply."

Studies on the proteolytic activity of barley malt, S. Laufer (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 307–330, figs. 3*).—The author tested a viscosity-change method, gelatin being used as substrate; a measurement of the extent of the proteolysis of edestin by a titration in alcoholic solution; and a similar titration method in which gelatin replaces the edestin. There was difficulty in obtaining uniformity or agreement of results, in that "the results obtained by the three methods for the proteolytic activity of malt infusions differ from sample to sample and show no definite trends or parallel relationships. The same applies to the proteolytic activity as secured by the three methods when compared to the extent of proteolysis effected in a laboratory mash." A tentative explanation for these discrepancies is offered.

Further studies of fluorine distillation, D. Dahle and H. J. Wichmann (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 297–303, figs. 2*).—Extending a previous investigation (E. S. R., 76, p. 149), the authors of this contribution from the U. S. D. A. Food and Drug Administration have now further found "that the recovery per cubic centimeter distillate decreases with increasing volume of liquid in the distilling flask, that distillations carried out at higher temperature give increased recoveries per cubic centimeter of distillate, that these variations in the recovery rate are greater when distillations are made with perchloric or phosphoric acid than with sulfuric acid, that the addition of soluble salts of nonvolatile acids to the system in the distilling flask causes a greater decrease in the recovery rate than would be expected from the increase in volume caused by the presence of such salts, [and] that the recovery for both perchloric and phosphoric acids varies with the amount of distillate collected, according to the logarithmic equation previously found to apply to distillations with sulfuric acid."

Report on hydrogen-ion concentration of alkaline soils, W. T. McGeorge (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 220, 221*).—The author of this referee report, a contribution from the Arizona Experiment Station, calls attention to certain causes of variation in the results of soil pH determinations.

"One of these is the error introduced by the time factor, that is, how soon after mixing the soil and water should the pH reading be taken. Base-exchange reactions will cause an increase or decrease in pH with time, depending upon the nature of the soluble salts present in the soil. In alkaline calcareous soils it is usually a reduction in pH.

"Another important source of error is the soil: water ratio. Lowest pH values are obtained by the lowest workable soil: water ratio, and this value approaches, most closely, the pH of the soil in the field. As the soil: water ratio is increased, the pH rises until the dilution reaches the point of maximum hydrolysis. This represents the maximum potential alkalinity of the soil and is usually a constant figure. Agreement on methods depends upon whether the objective is the pH of the soil in the field or the maximum alkalinity of the soils.

"It is of interest that results obtained in this laboratory show that pH values obtained by using tap water instead of distilled water for the soil suspension agree closely with the pH of the soil solution as obtained by displacement methods."

Studies in soil humus.—I, Estimation of soil humus by oxidation with alkaline permanganate, A. N. Puri and A. Sarup (*Soil Sci., 44 (1937), No. 4,*

pp. 323–327, fig. 1).—This method is proposed by the authors of this contribution from the Irrigation Research Institute, Lahore, India.

Boil from 1 to 2 g of the soil, depending on the amount of humus, with 20 cc N $KMnO_4$ in 0.05 N NaOH. Add more of the alkaline $KMnO_4$ solution if the color of the solution is destroyed within 10 min. of boiling. After the oxidation is complete, make up the $KMnO_4$-treated material to volume and filter. To 50 cc of the filtrate add sulfuric acid and excess of oxalic acid and titrate with $KMnO_4$. Each cubic centimeter of alkaline permanganate (N) equals 3.9 mg of carbon.

"The permanganate method as outlined is perhaps no improvement on Walkley and Black's method [E. S. R., 70, p. 742] in regard to simplicity and rapidity, but the important point is that by two different methods of oxidation practically identical results could be obtained. Whatever the nature of humus and its various fractions, it is unlikely that we are measuring by oxidation something vastly different from the actual material."

The following rapid, simplified preparation for mechanical analysis is also proposed: "Humus is destroyed by heating with alkaline permanganate. In the presence of an excess of the latter the operation is complete within 10 min. of boiling. Excess of $KMnO_4$ is filtered, and the soil is leached with 0.2 N HCl until free from calcium. The residue is washed back in a beaker and acidified with sulfuric acid, then manganese dioxide is brought into solution by the addition of normal oxalic acid from a burette in 2-cc lots, until the black color disappears. The soil is now leached first with 0.1 N NaCl until free from $MnSO_4$, and then with water four times, when it is ready for dispersion with NaOH."

The measurement of phosphate fixation in soils, B. E. Beater (*Soil Sci., 44 (1937), No. 4, pp. 277–291*).—According to the method proposed, "10 g of air-dried soil passed through a 1-mm sieve is placed in a 250-ml Erlenmeyer flask and 100 ml of diammonium phosphate solution (1 ml=0.04 mg P_2O_5) is added. The contents are refluxed for 30 min., and 25 ml is poured off into a measuring cylinder. To the remaining solution 0.75 g citric acid is added, and the boiling is continued for an additional 30 min. At the end of this time the solution is cooled and filtered, the filtrate being reserved for the colorimetric determination of phosphorus. The 25 ml previously removed is filtered under vacuum as described. Even with very clayey soils not more than 15 min. should be needed to obtain about 20 ml of clear filtrate. One ml of this filtrate is used for the colorimetric determination of phosphorus by the well-known ceruleomolybdate reaction, 1 ml of the molybdate solution and 6 drops of stannous chloride solution being used. The phosphorus in 5 ml of the citric acid extract to which a little 10-percent calcium acetate solution had been added was determined, after ignition, by extracting the residue with 5 ml 10 percent H_2SO_4 and making the extract up to 100 ml. Twenty ml of this extract was treated in a similar manner, as previously outlined.

"In interpreting these results, that part of the fixed phosphate which could not be removed by citric acid treatment was regarded as permanent, in the sense that it was unavailable, or perhaps very slowly available, to plants. That part removed by citric acid was regarded as temporarily fixed. Temporary fixation, then, need not be regarded as fixation from an agricultural point of view."

Report on less common elements in soil, J. S. McHargue and W. T. Forbes (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 222–225*).—In an associate referee's report from the Kentucky Experiment Station, the results of further collaborative work on the fusion and combustion methods for the de-

termination of iodine in soil are discussed. Both methods are recommended for adoption.

Report on fertilizers, G. S. Fraps (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 228–231*).—The referee for fertilizers, in a report from the Texas Experiment Station, recommends consideration by associate referees of various possible alterations in methods for determining potassium, phosphoric anhydride, and nitrogen.

Report on nitrogen, A. L. Prince (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 249–252*).—The associate referee on determination of nitrogen in fertilizers recommends, in a contribution from the New Jersey Experiment Stations, "that the method for the determination of water-insoluble nitrogen in cyanamide be further studied collaboratively with a view to its final adoption as Official."

Report on magnesium in fertilizers, J. B. Smith (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 252–263*).—The associate referee, in a report contributed from the Rhode Island Experiment Station, recommends changes in the title and wording of a method now considered to determine only "acid-soluble magnesia" and not "total magnesia"; "that the method presented for the determination of magnesia in water-soluble compounds, used as sources of magnesium in mixed fertilizers, be studied collaboratively; that the study of methods for active magnesia in mixed fertilizers be continued, with emphasis on the search for shorter procedures for determining magnesia after it is dissolved from fertilizers; [and] that a method for acid-soluble manganese be devised."

Effect of removing water-soluble compounds prior to determination of citrate-insoluble phosphorus in fertilizers, K. D. Jacob and T. H. Tremearne (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 277–287*).—The effect of removing water-soluble compounds prior to the determination of citrate-insoluble phosphorus in 43 samples of ordinary superphosphates, double superphosphates, ammoniated ordinary superphosphates, ammoniated double superphosphates, wet-mixed base goods, and complete fertilizer mixtures was investigated at the U. S. D. A. Bureau of Chemistry and Soils.

"With very few exceptions the results for citrate-insoluble phosphorus are lower on washed charges than on the corresponding unwashed charges. In general, the smallest differences between results on washed and unwashed charges are obtained with ordinary and double superphosphates and the largest with ammoniated ordinary superphosphates and heavily limed superphosphates. Varying the weight of the sample between the limits 0.5 and 2 g usually does not have a uniform effect on the differences between the results obtained on washed and unwashed charges.

"With ordinary and double superphosphates it makes little difference in the results for citrate-insoluble phosphorus whether the charge is washed with 75 or 225 cc of water prior to the citrate digestion. On the other hand, thorough washing of the sample as directed in the Official method seems to be important in the case of ammoniated ordinary superphosphate, heavily limed superphosphate, and wet-mixed base goods."

Data showing the solubilities of the principal superphosphate constituents in water and in neutral ammonium citrate solution are given. The effects of various compounds on the solubilities of phosphates in citrate solution are discussed.

Report on potash, H. R. Kraybill (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, p. 264*).—In an associate referee's report contributed from the Indiana Experiment Station, it is recommended that further study be given to the

following suggested change: "Weigh and remove the chloroplatinate precipitate by washing with hot water, using slight suction. Wash with 80 percent alcohol three times, dry as before, and weigh (loss equals K_2PtCl_6). Calculate to K_2O." It is further recommended "that studies be made of the errors resulting from the nonuniformity of the 2.5-g samples weighed out for the potash determination."

Further studies on the determination of available potash in fertilizers, S. F. THORNTON and H. R. KRAYBILL (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 287-297, figs. 2*).—The authors of this contribution from the Indiana Experiment Station find that "with some fertilizers the use of the present Official method gave water-insoluble residues in the potassium chloroplatinate precipitate. If not eliminated through the prescribed use of acidulated alcohol, these residues may be sufficiently large to cause appreciable errors when determinations are made by direct weighings. However, for the majority of materials, such residues were quite small. Analyses of several of these residues showed them to be composed principally of iron and aluminum phosphates with aluminum phosphate present in by far the larger amount. Calcium and magnesium compounds were present in only minor quantities.

"The addition of 0.6 cc of concentrated hydrochloric acid to the alcohol with which the potassium chloroplatinate precipitate is taken up in the platinum dish before filtration, as prescribed in the present Official method, eliminated the insoluble residues with all fertilizers studied. The use of this acidulated alcohol led to practically identical results regardless of whether the determination was made by direct weighing or by difference after leaching. Insoluble residues obtained with this procedure were no larger than those obtained with the former Official method."

Comparing the present with an earlier Official method as applied to the analysis of some of the less common fertilizer materials, the authors found that "with one such material ('flue dust') available potash values are 5.19 percent potassium oxide by the former Official method and 15.55 percent potassium oxide by the present Official method, a difference of 10.36 percent. Data obtained with both the Neubauer method and pot tests indicate that the higher value obtained with the present method represents the potash actually available to plants."

Report on acid and base-forming quality of fertilizers, L. E. HOBAT (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 264-275*).—This associate referee's report, submitted from the Indiana Experiment Station, recommends that the present tentative method "be studied in regard to the following proposed changes (1) substituting 0.5 N NaOH in the titration in place of 1 N NaOH, (2) minimizing the loss by spattering, and (3) eliminating water-insoluble material coarser than 20 mesh by wet sieving before the method is applied; [and] that the basicity of the phosphate rock and other factors that affect the method be studied further."

The simultaneous quantitative estimation of the percentages methoxyl and ethoxyl groups in organic substances, M. PHILLIPS and M. J. GOSS (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 2, pp. 292-297, fig. 1*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils obtain methyl and ethyl iodides from the methoxyl and ethoxyl content of the substance examined by a technic based on the Zeisel reaction but which separated the iodides by combining them with trimethylamine to form the iodides of the corresponding quarternary ammonium bases. The two quarternary ammonium salts are then separated by means of their very different solubilities in absolute ethyl alcohol, the ethyl compound having a solubility of 4.165 g

in 100 cc of the solvent at 25° C., while under like conditions the tetramethylammonium iodide has a solubility of but 0.040 g per 100 cc. Full manipulative detail is given.

The quantitative determination of lipase in milk, R. REDER (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *15* (*1935*), *pp. 49, 50*).—By an adaptation of standard procedures, the author of this contribution from the Oklahoma Experiment Station was able to detect in milk as little as 0.05 mg of an added lipase preparation.

"In this method calcium chloride was used to accelerate hydrolysis, and an ammonium chloride-ammonium hydroxide buffer, pH 8.9, was added to produce a favorable reaction. A commercial preparation of pancreatic steapsin was used as the source of fat-splitting enzyme. The degree of hydrolysis produced by increasing amounts of this preparation was first determined, using water as the diluting agent.

"The enzyme, suspended in water, was diluted with sufficient water to keep the total volume of the water solution 13 cc. Two and one-half g olive oil (acid-free), 2 cc buffer solution, pH 8.9, and 1 cc calcium chloride solution were added and the mixture shaken vigorously by hand for 3 min. and then placed in a thermostat at 30° C. for 57 min. The contents of the reaction vessel were washed into an Erlenmeyer flask with 95 percent alcohol so that the volume of the alcoholic liquid was 125 cc. Twenty cc ether were added and the acid titrated with 0.1 N alcoholic NaOH in the presence of thymolphthalein. The degree of hydrolysis was determined by subtracting the initial acidity of the reaction mixture, determined in controls, from the acidity of the reaction mixture following incubation.

"To test the applicability of this method of the estimation of lipase in milk, a second experiment was run in which milk took the place of water as the diluting agent. The milk was heated to 70° to inactivate any lipase present. Formaldehyde was added to the reaction mixtures to prevent bacterial action. From the degree of hydrolysis produced by the different amounts of the lipase when added to sterile milk, it was evident that the emulsion of milk and olive oil provides a substrate which is more favorable to the action of lipase than is the emulsion of water and olive oil. Using a 1-hr. incubation period, it is possible to detect the presence of 0.6 mg lipase preparation in milk. By increasing the incubation period from 1 hr. to 24 hr., it was possible to detect the presence of 0.05 mg lipase preparation. Because of the small amount of lipase which can be detected by this method, it appears to be suitable for the determination of lipase in milk."

The colorimetric determination of lactic acid in tomato products, F. HILLIG (*Jour. Assoc. Off. Agr. Chem.*, *20* (*1937*), *No. 2*, *pp. 303–307*).—A determination of the lactic acid content of tomato products may be of value in regulatory work because of the fact that "sound tomatoes contain little or no lactic acid, but . . . formation of this acid is associated in some instances with the spoilage of tomatoes."

The author of this contribution from the U. S. D. A. Food and Drug Administration describes a method based upon extraction of the lactic acid, purification of its solution with carbon, and the development, and colorimetric comparison with standards, of a yellow-colored complex formed upon adding ferric chloride.

Estimation of vitamin A, E. M. HUME (*Nature* [*London*], *139* (*1937*), *No. 3515*, *pp. 467, 468*).—In continuation of a previous report (E. S. R., 76, p. 154), biological tests made in nine different laboratories on halibut-liver oil showed a conversion factor of 1,470, with a range of individual values between 1,400

and 1,700. For the vitamin A concentrate the values were lower, most of them lying between 1,000 and 1,200. Spectroscopic tests demonstrated some deterioration in the solution of the concentrate, which is offered as an explanation of the lower values. It is concluded that these results do not warrant changing the value of 1,600 recommended by the International Conference (1934) for the conversion factor.

Modern methods of cider making, H. L. LANTZ (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 28–34*).—This is a brief discussion of current methods for producing high quality cider on a relatively small scale. The note is a contribution from the Iowa Experiment Station.

Alcohol yields from acid saccharified cereals, G. SEVERSON (*Iowa State Col. Jour. Sci., 11 (1937), No. 2, pp. 215–220*).—The author reports an investigation, carried out at the Iowa Experiment Station, in which optimum conditions for the acid saccharification of various grains from the standpoint of final reducing sugar concentrations and resulting yields of alcohol from the fermented acid hydrolyzed liquors were determined. Maximum alcohol yields were determined in the cases both of acid saccharification and of malting of the different grains, the latter giving the higher yields.

AGRICULTURAL METEOROLOGY

The problem of weather forecasting, A. SCHMAUSS (*Das Problem der Wettervorhersage. Leipzig: Akad. Verlagsgesell., 1937, 2. ed., pp. [5]+102*).—The need, bases, and methods of weather forecasting for various purposes are briefly discussed in the light of recent advances in this field.

Monthly Weather Review, [July–August 1937] (*U. S. Mo. Weather Rev., 65 (1937), Nos. 7, pp. 261–289, pls. 8, figs. 2; 8, pp. 291–321, pls. 9, figs. 7*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 7.—The Greenhouse Effect of Volcanic Dust, by W. J. Humphreys (pp. 261, 262); Shielded Storage Precipitation Gages, by J. C. Alter (pp. 262–265); Degree-Day Normals Over the United States, by A. G. Topil (pp. 266–268); The Rain-Bearing Winds at Knoxville, Tennessee, by S. Bunch (pp. 269, 270); and Analyses of Rains and Snows at Mount Vernon, Iowa, 1936–1937, by N. Knight (pp. 270, 271).

No. 8.—Climate of the West Front of the Wasatch Plateau in Central Utah, by R. Price and R. B. Evans (pp. 291–301); The Geometrical Theory of Halos, V, by E. W. Woolard (pp. 301, 302) (E. S. R., 78, p. 13); and Tropical Disturbances on the North Atlantic Ocean, August 1937, by W. E. Hurd (pp. 303, 304).

The chemical composition of the atmosphere, F. A. PANETH (*Quart. Jour. Roy. Met. Soc. [London], 63 (1937), No. 271, pp. 433–438; abs. in Sci. Abs., Sect. A—Phys., 40 (1937), No. 477, p. 930*).—Continuing previous studies dealing especially with the stratosphere,[1] the author presents what he considers the most valid figures now known for the composition of the atmospheric air near the ground, and discusses the results of observations on the composition of the air at different heights with special reference to hydrogen. He concludes that the round figures which he gives "are independent of height throughout the whole troposphere and in the first kilometers of the stratosphere."

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[1] Roy. Inst. Gt. Brit. Proc., 29 (1936–37), pt. 3, No. 138, pp. 350–366, figs. 3; Nature [London], 139 (1937), Nos. 3509, pp. 180–182, fig. 1; 3510, pp. 220–223, figs. 2.

Agricultural meteorology: Some characteristics of air temperature in Alberta and Saskatchewan, J. W. Hopkins (*Canad. Jour. Res., 15 (1937), No. 10, Sect. C, pp. 461–491, figs. 10*).—Continuing previous studies of precipitation (E. S. R., 78, p. 11), the author here reports and discusses results of observations on precipitation at four stations in Alberta and Saskatchewan for the period April 1 to August 31, 1893–1933.

Storm rainfall of eastern United States (*Miami [Ohio] Conserv. Dist., Tech. Rpts., pt. 5, rev. (1936), pp. [7]+352, figs. 203*).—A revision of a technical report by the engineering staff of the district (E. S. R., 38, p. 717).

Evaporation in Palestine, D. Ashbel (*Palestine Jour. Bot. and Hort. Sci., 1 (1936), No. 3, pp. 8–26, figs. 3*).—This article summarizes the available data on the quite variable evaporation in various climatic regions of Palestine as measured by means of the Piche tube. In all parts of Palestine the evaporation power of the atmosphere far exceeds the amount of annual precipitation, thus creating adverse conditions for plants with the extended growth cycles. The daily march of evaporation follows in general that of temperature. In the Jordan Valley on summer days evaporation rises to its daily maximum in the late afternoon. Evaporation is very high on hot and cold sirocco days, and it is recommended that sensitive plants be protected at their eastern borders against the desiccating effect of these winds.

The climate of New Zealand, E. Kidson (*Quart. Jour. Roy. Met. Soc. [London], 63 (1937), No. 268, pp. 83–92, pls. 8, figs. 2*).—This is an attractively illustrated descriptive account of climatic conditions in New Zealand.

"The products from the soil in New Zealand are, in general, those of temperate European countries and are to a large extent the same from one end of the country to the other, except insofar as they are determined by the rainfall. . . . For most of the various agricultural pursuits adopted in the different districts, the precipitation is about the optimum. The country as a whole, therefore, seldom has any serious set-back from either drought or excessive rainfall." Conditions are especially favorable for outdoor life and sports and generally good for aviation.

SOILS—FERTILIZERS

The Solonetz-like soils in southern California, C. C. Nikiforoff (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 781–796, fig. 1*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils shows that a "Solonetzlike morphology of some of the so-called Solonetz soils of southern California has not been developed through the normal soil-forming process but is due to the specific character of their parent material. Therefore, a morphological similarity of these soils with the true Solonetz cannot be considered as a proof of their Solonetz nature. A general character of distribution of these soils and a character of other soils with which the former are associated and of an environment of their formation are not similar to those of the true Solonetz soils. Therefore, it appears more likely that the so-called Solonetz soils of southern California are not the true Solonetz but should be regarded as pseudo-Solonetz or Solenetzlike soils because of morphological similarity of their profiles with those of the true Solonetz soil. This similarity is nothing more than a mechanical mimicry."

Movement of moisture in soil, M. R. Lewis (*Oreg. State Hort. Soc. Ann. Rpt., 28 (1936), pp. 164–171*).—The author, an irrigation engineer of the Oregon Experiment Station and the U. S. D. A. Bureau of Agricultural Engineering, considers the relationship of the plant to soil and soil water as "one of dynamics, that is of moving bodies and changing forces. Water is continually

moving from the moist soil to and into the roots and through the plant to the leaves where it is evaporated." He finds that "water will not move by capillary action more than a few inches at a rate fast enough to be of any importance to tree or nut growth; second, that infiltration into the soil may sometimes be very slow and may be very different in different parts of the same grove. Both of these findings mean that the grower needs to study moisture conditions in his soil. A great deal can be learned by the use of a soil auger or a shovel and simple examination of the soil. More can be done by systematic sampling and moisture determination."

Field measurements of capillary tension, S. J. Richards and J. Lamb, Jr. (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 772–780, figs. 3*).—In a joint investigation by Cornell University and the U. S. D. A. Soil Conservation Service field measurements of capillary tension were carried out over parts of two growing seasons (1935 and 1936). "Tensions were much higher during the comparatively dry summer of 1936. Relative values of capillary tension at various layers of the soil profile were consistent. Changes occurred where water was being lost or added before corresponding changes reached the other layers. The changes follow closely the precipitation data. Records of the capillary tension for two soils and for three crop relations on the same soil showed decided differences. These differences were maintained over the two summers. . . . Experimental curves relating moisture percentage and capillary tensions for samples of the Lordstown surface soil were found to differ, depending on whether the soil was drying or wetting. The drying curve was also changed when the soil structure was disturbed.

"The use of capillary tension for expressing soil moisture conditions eliminates the uncertainties which are introduced by the hysteresis and structure effects when moisture percentage is used. Capillary tension has the additional advantage of applying equally well for stony soils. Tensions cannot be measured with porous clay apparatus when they exceed 1 atmosphere, but within the range of 1 atm. they are readily obtainable."

The determination of soil reaction under field conditions by means of the spear-type glass electrode, W. T. McGeorge (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 841–844*).—Having shown that it is possible to determine the pH value of semiarid soils at moisture contents as low as 6 percent and that it makes little or no difference if the soil is dried and re-wet for the determination, the author of this contribution from the Arizona Experiment Station concludes that apparently "the spear type of electrode has supplied a long-felt need to the soil specialist and agronomist. In it we have equipment and a method which yields a value that truly represents the pH of the soil under any and all growing conditions. In addition to this it opens up an unlimited field of application to nutritional and plant beheavior studies which involve soil reaction in acid, neutral, and alkaline soils. It has been in use in this laboratory for several months, and the results may be obtained quickly and accurately and can be closely duplicated. The electrodes are thoroughly cleansed with a stream of distilled water after each determination to remove adhering soil, after which the electrodes are gently wiped with soft paper tissue. This leaves the electrodes slightly damp and assures immediate contact with the soil.

"The Beckman type pH meter was used in these experiments because of the spear type of electrode and the extension cable which especially adapts it to this sort of work."

Anion adsorption by soil colloids in relation to changes in free iron oxides, S. J. Toth (*Soil Sci., 44 (1937), No. 4, pp. 299–314*).—The author of this

contribution from the New Jersey Experiment Stations presents and analyzes experimental results showing the important role of the free iron oxide content of soil colloids with reference to silicate and phosphate adsorption.

"The removal of this constituent [free iron oxide] from soil colloids lessens the magnitude of phosphate adsorption and results in smaller increases in exchange capacity produced as the result of widening the acidoid: basoid ratio by the phosphate treatment. The adsorption of phosphates by the Colts Neck, Sharkey, Cecil, and Sassafras colloids was the result of the following series of reactions: Fractions of the adsorbed phosphates displaced silicate ions from the soil colloids; another fraction reacted with the free oxides of iron; [and] a fraction displaced hydroxyl groups from the basoid fraction. The phosphate-treated colloids exhibited more marked increases in exchange capacity and reductions in ultimate pH than the silicate-treated colloids, even though the latter treatment generally resulted in a more marked anion adsorption by the colloids. This was explained on the basis that the activity of the silicate ions is reduced at acid pH values, and the greater adsorption of this ion, when compared to the retention of phosphates, was due to the precipitation of amorphous silica. Adsorption of silicates and phosphates by the Colts Neck and Cecil colloids reduced the free iron oxide contents. The formation of new stable exchange groups in the two colloids was verified by the exchange capacity determinations of the colloids after the removal of the free iron oxides."

Studies on soil structure: Some nitrogen transformations in puddled soils, J. F. Breazeale and W. T. McGeorge (*Arizona Sta. Tech. Bul. 69 (1937), pp. 225–252, figs. 4*).—Although "the alkaline-calcareous soils are extremely active nitrifiers and ammonifiers," in part because these soils of the semiarid Southwest are well buffered at a desirable reaction range, it was nevertheless found that "on creating a puddled condition in these soil types nitrification is completely stopped and denitrification becomes quite active. Ammonium sulfate appears to be denitrified to a greater extent than sodium nitrate, and this may have a bearing upon the relative value of these two nitrogen fertilizers on poorly drained soils. . . . This experiment revealed a greater loss of nitrogen from the puddled soil [than from merely waterlogged or dispersed soil] regardless of whether it was added as nitrate or ammonia, and this loss was entirely as gaseous nitrogen. . . .

"When ammonium salts are added to the soil much of the ammonium ion is rapidly fixed by the colloids before nitrification. . . . In a well aerated soil the zeolite ammonia is just as readily nitrified as the sulfate. Under puddled conditions this is not necessarily true, as our experiments showed a slower rate or less nitrification and less denitrification of the zeolite form of ammonia. This appears to be true for the ammonia fixed as zeolite in the soil as well as the synthetic zeolite. . . .

"Throughout our studies in soil structure the critical moisture content—that is, the moisture content at which the soil structure is most seriously destroyed by agitation or vibration—is approximately that represented by the moisture equivalent. Regardless of how vigorously a soil is worked at moisture contents above or below this point it will not acquire its maximum degree of puddling. On studying nitrogen transformations from this angle the experiments revealed that the moisture equivalent is also the critical moisture content for microbiological oxidation processes in puddled soils. At this moisture content nitrification is checked and denitrification becomes active. If the soil is not in a puddled condition, then the critical point is not reached until the moisture content is about 1.4 times the moisture equivalent."

The effect of forest litter removal upon the structure of the mineral soil, H. A. LUNT (*Jour. Forestry, 35 (1937), No. 1, pp. 33–36*).—The Connecticut [New Haven] Experiment Station investigation here reported upon has shown that "where there is a favorable relationship existing between the forest floor and the mineral soil, i. e., rapid decomposition of the litter and its intimate mixing with the mineral soil, removal of the litter is quickly detrimental to the soil structure. This is of significance not only in erosion and flood control but also in the maintenance of favorable growing conditions for the forest, particularly with respect to reproduction."

A study of certain calcium relationships and base exchange properties of forest soils, R. F. CHANDLER, JR. (*Jour. Forestry, 35 (1937), No. 1, pp. 27–32*).—In an investigation reported from Cornell University, beech proved to be more abundant on the Canfield soil than on the Lansing, and basswood and American elm were more abundant on the Lansing series. The possibility that this distribution was associated with the calcium requirements of the species is suggested.

White cedar, red cedar, and white ash tended to maintain a high supply of exchangeable bases in the A horizon. Hemlock caused the soil to become more acid and depleted the supply of bases in the surface soil. "The fact that such differences existed between the soil under hemlock and that under the other stands indicates that the forest type may be very influential in maintaining the productivity of the soil from both a physical and chemical standpoint."

Availability of nutrients in nut orchard soils, R. E. STEPHENSON (*Oreg. State Hort. Soc. Ann. Rpt., 28 (1936), pp. 175–180*).—The author of this contribution from the Oregon Experiment Station finds, with respect to the orchard soils here considered, that "available nutrients however abundant in the topsoil cannot compensate for a poor soil from the fifth to the tenth foot. The deep horizons must permit good root development and contribute moisture and perhaps some nutrients to assure success with orchards on unirrigated lands. Thinner planting may help the condition on the shallow soils. Trees 60 ft. apart with roots 4.5 ft. deep draw from nearly the same volume of soil as trees 40 ft. apart with roots 10 ft. deep. . . . Ultimately, however, the older trees must outgrow the shallow soils, however wide the spacing. Lateral spread of roots can hardly compensate completely for lack of depth. . . . The productive value of soils is largely conditioned by the depth of profile which carries available nutrients and moisture to a vigorous root system."

Microorganisms in relation to nut orchard soils, W. B. BOLLEN (*Oreg. State Hort. Soc. Ann. Rpt., 28 (1936), pp. 183–185*).—The author presents, from the Oregon Experiment Station, a brief popular summary of the known functions of soil micro-organism in the maintenance and improvement of the fertility and productiveness of soils.

A comparison of the numbers of two species of Rhizobium and ammonia-oxidizing organisms in variously treated Iowa soils, D. W. THORNE and P. E. BROWN (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 877–882, figs. 3*).—The approximate numbers of *R. meliloti*, *R. trifolii*, and ammonia-oxidizing organisms in variously treated soils on the agronomy farm of the Iowa Experiment Station were determined at several different periods.

"The logarithms of the numbers of *R. meliloti* and *R. trifolii* in the soils studied had a highly significant correlation. The logarithms of numbers of *R. meliloti* and nitrite-forming organisms in the variously treated soils cropped to the 3-year rotation of corn, oats, and clover were highly significantly correlated. In similarly treated soils cropped to a 5-yr. rotation of corn, oats, red clover, winter wheat, and alfalfa, a highly significant correlation between

these organisms was also noted. The correlation between the logarithms of numbers of these organisms in soils cropped only to corn and oats was much lower, being just significant. The correlations between the actual numbers of organisms showed a similar trend to those found between the logarithms of numbers.

"The presence of legumes in a crop rotation seems to promote a more stable flora of the organisms investigated. The ammonia-oxidizing organisms and the legume bacteria studied showed similar responses to fertilizer treatments. Greater fluctuations were observed, however, in the numbers of legume bacteria. The ammonia-oxidizing organisms reached their maximum numbers in the spring or early summer. The alfalfa and red clover bacteria showed no consistent seasonal fluctuations."

The numbers of ammonia-oxidizing organisms in soils as influenced by soil management practices, R. H. Walker, D. W. Thorne, and P. E. Brown (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 854–864*).—In an investigation carried out at the Iowa Experiment Station the numbers of nitrite-forming bacteria developing during the course of a nitrification experiment varied with the amount, and with the degree of fineness, of the limestone applied to the soil employed. The numbers of ammonia-oxidizing organisms in the profiles of several Iowa soils decreased rapidly with depth in passing from the A_1 to the A_2 and to the B horizons. A study of the nitrite-forming flora of the variously treated farm plats showed that large increases in numbers nearly always occurred where limestone had been applied.

In addition to the limestone applications, a combination treatment of manure and rock phosphate was very favorable to these organisms. Manure or crop residues with limestone also usually brought about large increases in numbers as compared with those found in untreated soils. Manure alone favored an increased nitrifying flora in the plats cropped continuously to corn but showed no such favorable effect in the 5-yr. rotation series.

No distinct differences in numbers showed any one rotation studied to be superior, in favoring ammonia-oxidizing organisms, to other rotations.

The nitrite-forming bacteria in the soils studied reached their maximum numbers in the spring months.

Fertility losses from high plains soils due to wind erosion, W. H. Langham (*[Oklahoma] Panhandle Sta., Panhandle Bul. 63 (1937), pp. 15, figs. 2*).—Analyses of successive annual dust deposits in attics of abandoned houses have shown that "from the first period of erosion, which occurred in 1933, through that of 1937, the organic matter and nitrogen had decreased 22.6 and 20.3 percent, respectively. These results and a consideration of the literature suggested the following indications:

"(1) Fertility losses were heaviest the first 2 yr. of erosion and are approaching a minimum. (2) The plant nutrient losses over this area as a whole are not as heavy as is indicated by public opinion, and the effect on fertility alone, especially if minimized by conservation practices, would not limit agricultural recovery for several years even though the present adverse conditions continued. (3) Over the area as a whole the organic matter and nitrogen content of the undrifted cropped surface soils has been changed very little as a result of wind erosion. The principal damage to fertility constituents has occurred in the drifting soils and in individual cases, such as very susceptible shallow soils. (4) The drifting soils, over a 10- or 12-yr. period of present adverse conditions, would approach an organic matter and a nitrogen level approximately 70 percent of that of the cultivated soils or 60 percent

of that of the virgin surface (before serious wind erosion began) and at which continued losses in these constituents would be almost a minimum."

Infertile soils and means of improvement (*Montana Sta. Rpt. 1936, pp. 22–26, figs. 5*).—A soil, the experiments on which are detailed, was shown to need organic matter, phosphate, potassium, and an increased ratio of calcium to magnesium. Supplying these deficiencies resulted in satisfactory fertility.

The liberation of plant nutrients from the soil as affected by alfalfa, H. H. Hill (*Virginia Sta. Tech. Bul. 60 (1937), pp. 19, fig. 1*).—Continuing earlier work with rye (E. S. R., 71, p. 301), immature and mature alfalfa, mulched and turned, improved the tilth, reduced moisture losses, did not depress nitrification but increased the nitrate content of the leachings, and produced a slight temporary increase in soil acidity immediately after the addition of the organic matter. This gave place, in most instances, to a neutral or very slightly alkaline reaction.

The calcium content of the leachings from alfalfa-treated soil was greater, and the magnesium content was much greater, than the calcium and magnesium contents of the control soil leachings. The sulfur content of the leachings was also increased by the added organic matter, but the rate of potassium leaching was not markedly affected. A cover crop is considered needful for the prevention of the leaching losses and of erosion. "No worse orchard practice could be adopted than that of leaving the soil bare of cover during the winter period."

A mechanical apparatus for the rapid, high-temperature microbial decomposition of fibrous, cellulosic materials in the preparation of composts for mushroom cultures, B. B. Stoller, F. B. Smith, and P. E. Brown (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 717–723, fig. 1*).—The authors describe, in a contribution from the Iowa Experiment Station, an arrangement by which moisture and air are uniformly distributed in the compost and no firefang occurs. In practical trials, from 20 to 30 percent loss of dry weight or organic matter was obtained in from 7 to 10 days, and the evolution of carbon dioxide was very rapid. When air entering at the rate of 5 cu. ft. per minute was shut off, the carbon dioxide concentration passed from an initial 1.2 to 19 percent in 15 min.

The apparatus used consisted of a butter churn from which all of the rollers were removed, but the two baffles protruding 3 in. from the sides were allowed to remain. A 1-in. pipe with ⅛-in. holes about 2 in. apart was inserted through the central part. At one end the pipe was connected to an air line, and at the other end it was sealed, a piece of ¼-in. copper tubing passing through the seal to permit of the sampling of gases in the cylinder while it revolved. A water connection was also made along with the air inlet. The churn was geared down to make about one revolution in 8 min.

The quantity and rate of inflow of the air entering the cylinder was measured at first with a wet-test gas meter, later with a calibrated flow meter. The carbon dioxide and the oxygen determinations were made with Williams' modification of the Orsat apparatus. The moisture determinations were made on 100-g samples by drying in an electric oven at 105° C. The ash analysis was made in an electric muffle furnace at 700°.

What is the value of rapid soil tests for New Jersey? A. W. Blair (*Amer. Fert., 87 (1937), No. 9, pp. 7–9, 24, 26*).—The author of this contribution from the New Jersey Experiment Stations finds the results of 2 years' work with various soil tests, illustrative examples of which are given, to indicate that such tests are of definite value. He considers, however, that the pH value alone should not be relied upon in judging lime needs but that tests should also

be made for calcium, magnesium, and aluminum. The tests for available potassium and phosphate have been confirmed by results of fertilizer applications made in accordance with the indications of the tests.

Fertilizers in the production program, C. V. RUZEK (*Idaho State Hort. Assoc. [Proc.], 39 (1934), pp. 13–21*).—This is a general discussion of the function and application of various fertilizers in the treatment of field, orchard, and truck soils. It is also pointed out that "too much emphasis cannot be placed on water requirement. In nonirrigated sections many of the older orchards are now meeting with this deficiency, which in their earlier development with smaller trees was not a limiting factor. The remedy is not fertilization. With other crops this water requirement also becomes more exacting with increase in yield and is frequently limited."

The paper is a contribution from the Oregon Experiment Station.

The effect of fertilization on the replaceable bases in the soil, H. F. MURPHY (*Okla. Acad. Sci. Proc. [Okla. Univ.], 15 (1935), pp. 41–43*).—Determinations of the replaceable sodium and calcium contents of the soils of plats of Kirkland very fine sandy loam at the Oklahoma Experiment Station showed that "when either nitrate of soda or kainite or both was used as the chief ingredient in the fertilizer the amount of active sodium increased. The increase was as great whether the fertilizer was mainly kainite or nitrate of soda. . . .

"The increase in replaceable sodium in the surface 6 in. of soil receiving the 300 lb. annual application of nitrate of soda accounts for approximately one-fourth of the sodium applied. . . . Soils having a low Ca : Na ratio tend to deflocculate, are easily puddled, and seal over or run together on the surface after a rain. Such conditions do not allow penetration of water, and heavy run-off is the result. Much of our eroded soil in this state is of this nature. Many of the gullies now so prominent in our farm lands had as their origin one of these alkali spots. Such soil has a tendency to remain in suspension once it acquires this state and therefore may be easily carried away in the run-off water.

"While the Ca : Na ratios on these fertilized plats are all well above those in the unfavorable soils examined in the erosion Solonetz soil study, yet the plats having the high replaceable sodium content in this study have a poorer physical condition than those with the lower sodium content. Soils having a good physical condition are soils with a high ratio of calcium to sodium in their base-exchange complex."

A study of various organic and inorganic phosphates, with special reference to their ability to penetrate soils and to their positional and chemical availability to plants (*Nevada Sta. Rpt. 1936, pp. 31, 32*).—A report by V. E. Spencer is given, stating that "pot cultures using a phosphorus-deficient soil from Illinois have again shown the distinct superiority of calcium sorbityl- and calcium glucose-phosphate over treble superphosphate, in the matter of chemical availability." Fermentation of glucose or sugar in the presence of sodium phosphate resulted in a complete transformation of inorganic to organic phosphate, the product being fructosediphosphate. Though this compound has not been isolated pure, "tests of the crude product from this process have shown from 60 to 70 percent of the total phosphorus in this product to leach through the plowed depth of soil. Thus this product is essentially as efficient, in permeating soil all of high phosphate-fixing power, as the other organic phosphates."

Comparative efficiency of calcined phosphates, J. J. SERRALLES, JR. (*Soil Sci., 44 (1937), No. 3, pp. 175–183, pl. 1*).—The author, in an investigation carried

out at Pennsylvania State College, compared the availability, as indicated both by pot tests and by chemical methods, of phosphates calcined at 1,400° C. in the presence of sufficient silica to bring about the volatilization of a considerable part of the fluorine, with that of superphosphate and of untreated rock phosphates.

"As measured both by yields of oats and by amount of phosphoric acid recovered by the crop, the calcined phosphates were found to be equal to superphosphate and far superior to untreated rock phosphates. These new phosphates have a high availability as measured also by their solubility in ammonium citrate, and a close agreement was found to exist between the chemical and the vegetation availabilities."

The relative weight of shoot and root of different crops and its agricultural significance in relation to the amount of phosphate added to the soil, M. A. J. Goedewaagen (*Soil Sci., 44 (1937), No. 3, pp. 185–202, figs. 2*).—At the National Experiment Station at Groningen, Netherlands, the author grew *Triticum vulgare*, *Vicia faba*, and *Avena sativa* in wooden boxes containing sandy soil, low in phosphate, to which increasing amounts of phosphate ($CaHPO_4$) were added, with the purpose of studying the effect of the distribution of the phosphate in the soil on the development of the root system.

"In our experiments it was found that the shoot: root ratio, in general, increased with increasing phosphate supply. The weights of both the shoot and the root increased with the amount of phosphate, the shoot weight to a greater extent than the root weight. With large applications of phosphate the root weight remained constant or was lowered, and the shoot: root ratio continued to increase. . . .

"With increasing phosphate supply the increase of the shoot: root ratio was associated with a rise in the amount of phosphate absorbed per unit of root weight. The latter rose to such a degree that the total amount of phosphate absorbed by the plants increased considerably in spite of the relative or the absolute diminution of the root weight. In other words, the reduction of the root weight was overbalanced by the enhanced intake of phosphate by the roots.

"The rate of photosynthesis was likewise increased, though more especially in the range of lower phosphate supplies. This was indicated by the increasing weights of the plants when greater amounts of phosphorus were available in the soil. A relationship exists between the shoot: root ratio and the rate of photosynthesis. This rate rises when the shoot: root ratio increases, as the latter is accompanied by a more extensive development of the shoot, i. e., by an increase of the assimilating surface of the plant."

An exception occurred, under certain conditions, in the experiment with oats, in that "a decrease of the shoot: root ratio was observed with increasing phosphate supplies, but only when the plants were grown in small boxes in which the phosphate was uniformly distributed and when excessive amounts of phosphate were supplied."

The agricultural value of specially prepared blast furnace slag, J. W. White, F. J. Holben, and C. D. Jeffries (*Pennsylvania Sta. Bul. 341 (1937), pp. 28, figs. 5*).—The following statements cover some of the more important conclusions drawn from field-plat experiments with agricultural slag (a granulated product prepared by running the molten slag into cold water), reported in extensive detail.

"The relative acidity-correcting values of agricultural slag and limestone are correlated with their crop-producing capacity. At the end of 2 yr. in contact with the soil, 1 ton of 20-mesh limestone reduced the acidity of the soil by [the equivalent of] 1,682 lb. of calcium carbonate as compared with 1,497 lb.

[equivalent] corrected by 8 tons of agricultural slag. One ton of agricultural slag contained 970 lb. of 20-mesh material. The acidity corrected in 6 yr. by 1 ton of agricultural slag was equivalent to 965 lb. of calcium carbonate.

"Air-cooled slag screenings produced yields of total air-dry matter (field weight of all crops) on tiers 2, 3, and 4 equivalent to the yields produced by an equal application of water-cooled agricultural slag. The average of the total yields of all crops was 33.66 and 33.78 tons respectively.

"The agricultural value of blast furnace slag, as of all forms of basic lime, is dependent upon its fineness. During the first 3 yr. of the experiment 1 ton of agricultural slag produced 5,380 lb. of crops more than unlimed soil, as compared to 17,280 lb. produced by 1 ton of 20-mesh slag and 19,720 lb. produced by 1 ton of fine slag. The pounds of lime oxides (CaO and MgO) supplied per ton of materials were 932, 942, and 1,058 respectively."

The effects of certain lime materials on the leachings from Frederick silt loam soil, W. B. Ellett and H. H. Hill (*Virginia Sta. Tech. Bul. 61 (1937), pp. 19*).—It is stated that "the addition of lime materials and organic matter [clover hay and stable manure] gave slight increases in the amount of water passing through the soil. The average percentage of percolation for the three depths of soil was 24.5 percent of the rainfall.

"All lime additions resulted in increased amounts of calcium in the drainage, when compared with the control soil left in a fallow condition. The highest outgo of calcium in the 1-ft. series of tanks resulted from the addition of burnt lime. In the 2-ft. depths of soil, the addition of limestone resulted in the greatest loss of calcium in the leachings. The loss of calcium was less in the 4-ft. depths of soil than in the other two series. Organic matter with lime gave greater losses of calcium than the lime materials applied alone. Magnesium additions repressed the outgo of calcium and increased the outgo of magnesium in the drainage. This repressive action was noted as a result of the addition of lime in either the carbonate or caustic form.

"Calcium and magnesium determinations showed that the addition of one form of lime was about as effective as another insofar as the total calcium passing into the drainage was concerned. The dolomitic forms of lime were almost as soluble in the soil water as the carbonate and caustic forms. Dissolved carbonates appearing in the leachings were small in amount, indicating that a large proportion of the bases leached from the soil were in the form of neutral salts. The addition of the several forms of lime materials affected the outgo of nitrate nitrogen very slightly, but when both lime and organic matter were applied large amounts of nitrate appeared in the leachings. There was a fixation of sulfur by the soil. The fixation of this element increased with the depth of soil and subsoil employed. In many cases the sulfur brought to the soil by rainfall was greater than that leached from the soil."

Liming Kansas soils, H. E. Myers, A. L. Clapp, and F. E. Davidson (*Kansas Sta. Circ. 185 (1937), pp. 26, figs. 13*).—The circular presents a semipopular discussion of limes and liming materials, the preparation of naturally occurring limestone for agricultural use, the lime requirements of some Kansas soils, as determined by peat trials, home pulverizing of limestone by means of portable crushers, etc.

Soil liming investigations.—V, The relation of boron deficiency to overliming injury, J. A. Naftel (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 761–771, figs. 8*).—In this extension of a series recently noted (E. S. R., 78, p. 165), the author reports that excessive liming of a Norfolk loamy sand produced, in some cases, practically a crop failure in a number of field and garden crops

and that neither large applications of phosphatic fertilizers nor manganese treatment had a remedial effect. Basic slag, even in quantities sufficient to render the soil alkaline, did not cause such failures, and boron componnds, in the proportion of 1 p. p. m. of the element, prevented the excessive liming with pure calcium carbonate from injuring the crops used on the soil tested.

"The mechanism involved in rendering boron unavailable to plants has not been explained. The possibility of precipitation of insoluble borates is discounted, but the possibility of biological absorption of boron by micro-organisms is pointed out."

Minor fertilizer elements, R. C. Collison *(Farm Res. [New York State Sta.], 4 (1937), No. 1, p. 7).*—Only three soils of New York State "were found to possess a combination of characteristics which might result in a shortage of one or more important plant food elements with consequent injury to the crop." It is noted that "soils which are likely to show deficiencies of the minor elements are those high in silica but low in silicate minerals and low in organic matter, soils low in lime or those from which most of the lime has been leached, and soils showing little or no compaction and in which unobstructed leaching has taken place."

Some recent observations on the use of minor elements in North Carolina agriculture, L. G. Willis and J. R. Piland *(Soil Sci., 44 (1937), No. 4, pp. 251–263, pls. 3, fig. 1).*—Laboratory, greenhouse, and field experiments are considered by the authors of a communication from the North Carolina Experiment Station to indicate that "copper, manganese, and boron may function as soil amendments or plant nutrients, depending on soil and climatic conditions.

"Oxidation-reduction reactions in the soil are governed by microbial reduction and oxidation by means of catalysts. Manganese deficiency is associated with an oxidation-reduction reaction in which organic matter is involved and in which the limiting pH value represents a condition under which the higher oxides are insoluble. Copper acts primarily as a catalyst of oxidation in organic soils, the major beneficial effect being due to a regulation of the solubility of iron within the limits of the tolerance of crops. Manganese has a catalytic effect similar to that of copper but is less efficient. Phosphates increase the injury factor of organic soils which is controlled by copper; therefore copper sulfate should ordinarily be applied with the fertilizer. Boron deficiency is widespread in North Carolina soil. The symptoms range from characteristic deformities of the plants to abnormal tendencies to wilt in dry seasons. Root malnutrition and defective solvent action by roots are associated with boron deficiency. There is evidence that the reductive intensity of the rhizosphere increases as a consequence of supplying boron to a deficient soil and that copper may be needed to correct this condition. Under some conditions potassium will produce an effect comparable to that of copper. This is apparently due to a nonnutrient function of potassium that is associated with an unidentified soil defect.

"The indiscriminate use of the minor elements is not recommended without further experimentation in the field, although some crops in rotations may be benefited."

Commercial fertilizers in 1936–37, G. S. Fraps, S. E. Asbury, and T. L. Ogier *(Texas Sta. Bul. 553 (1937), pp. 53).*—This bulletin contains the 1936–37 fertilizer analysis data and related information, including suggestions for various crops and regions. Total fertilizer sales showed an increase of about 40 percent over those of the preceding year. Sales of mixed fertilizers were mostly confined to about 20 analyses.

AGRICULTURAL BOTANY

Botany: A textbook for colleges, J. B. HILL, L. O. OVERHOLTS, and H. W. POPP (*New York and London: McGraw-Hill Book Co., 1936, pp. XIII+672, pl. 1, figs. 335*).—This text is said to "comprise the subject matter of a two-semester college course in general botany." Part 1, the structure and physiology of seed plants, includes coloration in plants; plant cells; leaves; metabolism—food synthesis; roots; absorption of water and inorganic salts; stems; growth and movement; flowers; fruits, seeds, and seedlings; and metabolism—the catabolic phase—digestion, respiration, and fermentation. Part 2, the plant groups, takes up the classification of plants; Thallophyta—algae and fungi; Bryophyta—liverworts and mosses; Pteridophyta—ferns and their allies; Spermatophyta—seed plants; families of angiosperms; and heredity.

Grass studies.—II, Additions to the flora of Arkansas, E. L. NIELSEN (*Rhodora, 39 (1937), No. 466, pp. 423, 424*).—In this further contribution (see p. 319) by the University of Arkansas, brief note is made of extensions in the range of eight species.

Plant anatomy, H. MOLISCH (*Anatomie der Pflanze. Jena: Gustav Fischer, 1936, 4. ed., rev., pp. VIII+160, figs. 155*).—The descriptive text is grouped under the three main section headings of cells, tissues, and organs. A final section discusses the ultimate goal of anatomy, viz, the correlation of form with function. Improvements and supplementary material have been added especially to the sections dealing with the ultramicro-organisms, viscosity, vital staining, plasmolysis, chromosomes, protein crystals, the significance of lignin, and protoplasmic plant anatomy.

The plasmatic character of the cell bridges in plants [trans. title], A. MÜHLDORF (*Bot. Centbl., Beihefte, 56 (1937), Abt. A, No. 2-3, pp. 171-364, pls. 3*).—This monograph defines the conception and gives the general characteristics of cell bridges or plasmodesms, reviews the pertinent literature (with over 5 pages of bibliography), describes the general structure of the cell wall and the materials and methods used, and gives the detailed results of studies of various plant groups from the bacteria to the flowering plants.

Improvements in plant cytological technique, L. LA COUR (*Bot. Rev., 3 (1937), No. 5, pp 241-258*).—This is a review of recent improvements (with 65 literature references) in fixing technics (including permanent smears, permanent acetocarmine smears, root-tip smears, and fixation of material for embedding); fixing fluids (types and recommended formulas); dehydration and infiltration; chromosome stains; pretreatment; and illumination and projection.

Aceto-carmin mounting media, C. ZIRKLE (*Science, 85 (1937), No. 2213, p. 528*).—Improvements in the technic are reported by which preparations may be made permanent by adding to the fixing solution certain inert substances not altering the fixation image but serving as mounting media when the acetic acid and water evaporate. Formulas for two such mixtures are given.

A photoconductive photometer—A new method and apparatus for the quantitative estimation of chlorophyll, B. N. SINGH and N. K. ANANTHA RAO (*Cur. Sci. [India], 5 (1937), No. 8, pp. 416-418, figs. 2*).—The principle of the apparatus described and illustrated consists essentially "in determining the amount of light absorption of an alcoholic extract of plant pigments within a narrowly defined region of the spectrum, for which the chlorophylls possess a marked absorption, while the absorption of the other pigments is infinitesimal." The accuracy of the method is said to be ± 2 percent.

Microclimatic and plant temperature recording with the multithermograph of Hartmann and Braun [trans. title], B. HUBER (*Jahrb. Wiss. Bot.,*

84 (1937), No. 5, pp. 671–709, figs. 13).—The results of tests with this multithermograph (equipped with a six-color recorder) for the thermoelectric registering of plant, soil, and air temperatures, and its applications as an ecological field apparatus, including various precautions, are detailed.

Method of stirring gases within a closed chamber, J. W. Mitchell and W. E. Martin *(Plant Physiol., 12 (1937), No. 2, pp. 557, 558, fig. 1)*.—"In principle the method consists of rotating a fan inside of a chamber by means of a magnetic coupling which operates through the glass wall of the chamber in such a way as to cause the enclosed fan to turn synchronously with a revolving electromagnet on the outside of the chamber." The rate of circulation may be readily adjusted.

A contribution to the knowledge of the light field of plants and of leaf pigments [trans. title], K. Egle *(Planta, Arch. Wiss. Bot., 26 (1937), No. 4, pp. 546–583, figs. 15)*.—This paper discusses the results of a physiological and ecological study of the distribution of light to forest, open-field, and submerged plants, and of the distribution of leaf pigments and their various relationships to light under different conditions of wavelength and incidence.

Photosynthesis and the absorption spectra of plant pigments, I, G. R. Burns *(Amer. Jour. Bot., 24 (1937), No. 5, pp. 257–265, figs. 3)*.—In continuation of studies by the Vermont Experiment Station relative to the mechanism of photosynthesis (E. S. R., 75, p. 457), an attempt is made to evaluate the known errors and to describe the experimental method in such a way that "the magnitude of the factors of which we are not aware, but which influence the results, may be correctly estimated." By a method described, the relative amounts of photosynthesis by white pine in different portions of the spectrum may be calculated from physical measurements. The results obtained showed general agreement between the observed and calculated values for photosynthesis and indicate that, other things being equal, the "primary absorption" curve is undoubtedly the same as the photosynthetic curve.

The agreement of the observed and calculated efficiencies in the tests comparing red and yellow light explains the photosynthetic differences between the pines grown in red light and those grown in blue light as being due to their different colors. This color difference is in the yellow and not in the red. The absorption spectra of the pigments showed that the color difference is due to differences in the relative amounts of at least two pigments, which was shown by comparing solutions from the two types of trees in a colorimeter.

Photosynthesis of Chlorella in heavy water, F. N. Craig and S. F. Trelease *(Amer. Jour. Bot., 24 (1937), No. 4, pp. 232–242, figs. 7)*.—It is inferred from the results of the experiments described that H_2O, as well as D_2O, enters into the dark stage rather than into the photochemical stage of photosynthesis.

Photosynthesis in relation to light and carbon dioxide, E. L. Smith *(Natl. Acad. Sci. Proc., 22 (1936), No. 8, pp. 504–511, figs. 5)*.—The results of varying light intensity and CO_2 concentration on photosynthesis in the fresh water plant, *Cabomba*, are compared with those of other workers with other plants.

The influence of light and carbon dioxide on photosynthesis, E. L. Smith *(Jour. Gen. Physiol., 20 (1937), No. 6, pp. 807–830, figs. 8)*.—The author has made extensive measurements with one plant for the effect of CO_2 concentration and light intensity and has compared them with previous data for other plants under conditions showing their basic similarities and differences. Pursuant to this work, "an optical system is described which furnishes an intensity of 282,000 meter-candles at the bottom of a Warburg manometric vessel. With such a high intensity available it was possible to measure the rate of photo-

synthesis of single fronds of *Cabomba caroliniana* over a large range of intensities and CO_2 concentrations.

"The data obtained are described with high precision by the equation $KI = \rho/(\rho^2_{max.} - \rho^2)^{1/2}$, where ρ is the rate of photosynthesis at light intensity I, K is a constant which locates the curve on the I axis, and $\rho_{max.}$ is the asymptotic maximum rate of photosynthesis. With CO_2 concentration substituted for I, this equation describes the data of photosynthesis for *Cabomba* as a function of CO_2 concentration. The above equation also describes the data obtained by other investigators for photosynthesis as a function of intensity, and of CO_2 concentration where external diffusion rate is not the limiting factor. This shows that for different species of green plants there is a fundamental similarity in kinetic properties and therefore probably in chemical mechanism. A derivation of the above equation can be made in terms of half-order photochemical and Blackman reactions, with intensity and CO_2 concentration entering as the first power, or if both sides of the equation are squared, the photochemical and Blackman reactions are first order and intensity and CO_2 enter as the square. The presence of fractional exponents or intensity as the square suggests a complex reaction mechanism involving more than one photochemical reaction. This is consistent with the requirement of 4 quanta for the reduction of a CO_2 molecule."

Experiments on the illumination of seed by light of different wavelengths [trans. title], A. A. KUZMENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 14 (1937), No. 4, pp. 227–230, figs. 3*).—Seed of wheat (*Tr[iticum] vulgare* and *T. durum*), *Perilla ocymoides*, *Nicotiana rustica*, and tobacco were exposed during germination to light of different wavelengths or to darkness for 10–15 days and then transplanted to pots, where their growth was observed under natural light conditions. Growth of wheat was accelerated in the range of red-yellow, and its height and total weight were increased. Blooming of *Perilla* was hastened in this range. A marked increase in growth occurred in tobacco treated with red-yellow light, but a retardation with blue light. The amount of nicotine was also influenced by the wavelengths applied to the seed.

Effect of ultraviolet radiation on indole-3-n-propionic acid, D. HARE and H. KERSTEN (*Plant Physiol., 12 (1937), No. 2, pp. 509–518, figs. 7*).—"Irradiation of indole-3-*n*-propionic acid with ultraviolet light from a mercury arc changes many of its physical properties and also changes its effect on the roots of plants."

Wick culture of seedlings with different rates of water flow, M. A. RAINES (*Amer. Jour. Bot., 24 (1937), No. 4, pp. 185–187, figs. 2*).—With the apparatus described, a plant may be grown with its root system confined to the very thin space between a sheet of wet black blotting paper and a sheet of glass. The culture solution moves through the paper at an easily regulated rate.

The assimilation by plants of various forms of nitrogen, W. J. ROBBINS (*Amer. Jour. Bot., 24 (1937), No. 5, pp. 243–250*).—In this contribution by the University of Missouri, "it is suggested that plants may be grouped according to their ability to assimilate various forms of nitrogen as follows: Group 1, nitrogen-fixing organisms—capable of assimilating nitrogen as gaseous nitrogen, nitrates, ammonium salts, and organic nitrogenous compounds. Group 2, nitrate-ammonium organisms—capable of assimilating nitrogen as nitrates, ammonium salts, and organic nitrogenous compounds; incapable of assimilating gaseous nitrogen. Group 3, ammonium organisms—capable of assimilating nitrogen as ammonium salts and organic nitrogen; incapable of assimilating gaseous nitrogen and nitrates. Group 4, organic nitrogen organisms—capable

of assimilating organic nitrogenous compounds; incapable of assimilating gaseous nitrogen, nitrates, and ammonium compounds.

"The hypothesis that ability to assimilate various forms of nitrogen is associated with redox potentials of the organisms is suggested. Determinations by the Clark series of redox indicators of the redox potentials of media in which an ammonium organism, *Rhizopus nigricans*, and a nitrate-ammonium organism, *Aspergillus niger*, were grown show the latter to have a somewhat higher apparent reducing intensity than the former. Poising the medium by the addition of various substances having redox potentials from +0.011 to +0.43 does not inhibit the growth of *A. niger* in the presence of ammonium salts, nitrates, or peptone. The evidence presented on the relation of redox potentials to the assimilation of various forms of nitrogen is considered to be negative."

A bibliography of 45 references is appended.

On the effects of light and of oxygen on the uptake of sugar by the foliage leaf, E. Phillis and T. G. Mason (*Ann. Bot.* [*London*], *n. ser., 1* (*1937*), *No. 2, pp. 231–237, pl. 1*).—Formation of starch by cotton leaf discs, previously destarched and then immersed in sugar solution, was accelerated independently by oxygen and by light. Either factor appeared to hasten starch formation by increasing the sugar absorption rate rather than by any effect on the starch-sugar equilibrium. After briefly discussing the possible mechanisms by which such an increased sugar absorption could be induced, it is stated as probable that light increases the permeability of the plasma membrane and that oxygen affects the solvent capacity of the cytoplasm.

On the dynamics of sugar in the stem of sweet sorghum in connection with its development and maturation and the time for reaping, S. I. Kokina and A. ÎA. Kokin (*Bot. Zhur. S. S. S. R.* (*Jour. Bot. U. R. S. S.*), *21* (*1936*), *No. 6, pp. 637–644; Eng. abs., pp. 643, 644*).—Sucrose was found to be the prevailing sugar in all stages of growth, continuing to increase until the wax stage of seed maturity but accumulating most rapidly during the blooming stage. The maximum content in glucose and maltose occurred during the stages preceding seed maturity and reached a minimum toward the stage of full maturity. In overripe sorghum there was a decrease in sucrose and total sugars. With respect to sucrose, the best time to harvest is at the stage of full maturity of the seed, while for the best yield in sweet sirups and alcohol the stage of wax ripeness is most favorable. However, for a month after full ripeness the sugar content decreased by only 5.8 percent of the dry substance of the stem, while at the same time the starch content increased by nearly 4 percent, so that the total amount of mobile carbohydrates had actually undergone an insignificant change from that at full ripeness.

Cross transfer of mineral nutrients in the tobacco plant, J. E. McMurtrey, Jr. (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 7, pp. 475–482, figs. 4*).—Failure of cross transfer as indicated by symptoms manifested is reported for nitrogen, phosphorus, potassium, magnesium, sulfur, and iron when any one of these elements is withheld from a portion of the root system grown in solution cultures. The cross transfer in some cases failed to take place from one to the other half of an individual leaf. A twisted or one-sided growth due to failure of complete cross transfer was evident with each of the above-mentioned elements and also with calcium and boron. The possible relationship of these findings to fertilizer placement under field conditions is pointed out.

Investigations of the action of silicic acid and boron, as well as some other trace elements, on the growth of peas, broadbeans, and soybeans [trans. title], K. Scharrer and W. Schropp (*Bodenk. u. Pflanzenernähr., 1*

(*1936*), *No. 5–6, pp. 370–383, figs. 5*).—The author reports studies of the effects of boron and silicic acid applied together, with or without the addition of the so-called combination solutions of trace elements, on the growth of these three plant species in water culture. Throughout the experiments the combination of boron with silicic acid in the right proportions had a better effect on the growth and yield of the plants than boron applied alone. Also the boron requirement of broadbeans proved to be greater than that of peas and less than that of soybeans.

Parthenocarpy of gladiolus induced by β-indolylacetic acid [trans. title], P. HAGEMANN (*Gartenbauwissenschaft, 11* (*1937*), *No. 2, pp. 144–150, figs. 2*).—The author reports what he believes to be the first case of artificial induction of parthenocarpic fruits by the use of a definite chemical compound, viz, a so-called growth-promoting substance, β-indolylacetic acid. Negative results were obtained with phenylacetic acid.

Avena coleoptile curvature in relation to different concentrations of certain synthetic substances, G. S. AVERY, JR., P. R. BURKHOLDER, and H. B. CREIGHTON (*Amer. Jour. Bot., 24* (*1937*), *No. 4, pp. 226–232, figs. 5*).—"The following synthetic organic compounds were found to be effective in promoting growth curvatures of the *Avena* coleoptile (Went method): Methyl 3-indoleacetate, potassium 3-indoleacetate, γ-3-indolebutyric acid, methyl γ-3-indolebutyrate, potassium γ-3-indolebutyrate, α-naphthaleneacetic acid, potassium α-naphthylacetate, methyl α-naphthylacetate, ethyl α-naphthylacetate, β-3-indolepropionic acid, and potassium β-3-indolepropionate." Within certain limits the curvatures induced were mostly proportional to the concentration, and they were not due to H-ion concentration. It was found that 3-indoleacetic and γ-3-indolebutyric acids and their derivatives were most effective in inducing curvature, and that the potassium salts of these and of α-naphthaleneacetic acid were generally more effective than the acids. The other compounds tested proved less active at the concentrations used.

The distribution of many of these substances could be determined in the tissues. It was found that transverse movement of compounds in the coleoptile reduced the magnitude of curvature, and that the extent of such movement depended on the concentration and kind of compound used. The rate of longitudinal movement affected the "shape" of the curvature, and this depended on the nature of the compound rather than on its concentration. Both factors must be considered in the standard *Avena* test.

Effect of the roots on the production of auxin by the coleoptile, J. VAN OVERBEEK (*Natl. Acad. Sci. Proc., 23* (*1937*), *No. 5, pp. 272–276, fig. 1*).—Removal of the roots reduced the auxin production of the coleoptile of oat seedlings markedly, causing a decreased growth but also an increased sensitivity for auxin. New formation of auxin after decapitation occurred in plants from which the roots had been removed. Plants with both roots and seed removed had a lower initial sensitivity but failed to "regenerate," their curvatures increasing steadily. Two ways in which the auxin from the seed may reach the shoot apex are suggested.

Investigations on the specificity of the action of auxins for the Avena and pea tests, E. M. SHACKELL (*Austral. Jour. Expt. Biol. and Med. Sci., 15* (*1937*), *No. 1, pp. 33–42, figs. 3*).—"As negative results were obtained with the majority of the substances tested [heteroauxin, chemically related substances, enzymes of plant origin, active substances of animal origin, and various substances exhibiting some particular activity of physiological or chemical interest], it is quite clear that the plant responds to a restricted and definite structure for the promotion of growth. The pea and *Avena* tests are, however, not specific for

the auxins as claimed by [F. W.] Went (1934), as a positive reaction was obtained with thionaphthene-3-acetic acid and the results of [K. V.] Thimann with cis-cinnamic acid were confirmed. It would appear that the acetic acid group in the β position of the indole ring is essential for activity as a growth hormone. The molecule may be inactivated by alteration of the region. Replacement of the nitrogen in the indole ring itself, either by carbon, oxygen, or sulfur, however, does not inactivate the growth-promoting properties of the molecule. This indicates that there may be a wide range of growth-promoting substances in which other elements than nitrogen may be in the cyclic system. The negative results obtained with enzymes and substances of some particular physiological or chemical interest emphasize the selectivity of plant growth reactions."

Growth and production of growth-promoting substance by Raphanus sativus in dry and moist air [trans. title], C. J. Gorter and G. L. Funke (*Planta, Arch. Wiss. Bot., 26 (1937), No. 4, pp. 532–545, figs. 4*).—Growth and cell stretching in *R. sativus* seedlings cultured in Knop's nutrient solution were stronger in moist than in dry air, other factors being equal. In moist air the cotyledons formed less growth-promoting substance. The latter was not inactivated in the stem, as is the case with auxin-a. The concentration of the cell sap was similar in dry- and moist-air plants. The elasticity and plasticity of plants were about twice as great in moist as in dry air.

Several esters as plant hormones, P. W. Zimmerman, A. E. Hitchcock, and F. Wilcoxon (*Contrib. Boyce Thompson Inst., 8 (1936), No. 1, pp. 105–112, figs. 2*).—As a result of this study, nine esters are added to the list of growth substances, viz, methyl α- and ethyl α-naphthaleneacetates, methyl, ethyl, *n*-butyl, and iso-butyl phenylacetates, methyl β-indoleacetate, methyl β-indolepropionate, and methyl β-indolebutyrate. Methyl esters of these compounds induced adventitious roots on stems, leaves, and roots and caused local growth accelerations and other responses characteristic of growth substances. Methyl β-indoleacetate proved more effective than heteroauxin (β-indoleacetic acid). The methyl esters of indole compounds were more effective in inducing bending responses than their corresponding acids, but those of naphthalene and phenyl compounds were slightly less so. The methyl esters were more effective than the ethyl, and the latter than the butyl esters. The esters were taken up by the roots from aqueous solutions added to the soil and transported upward, as indicated by formative responses in aerial parts of the plants.

Gravity-position of tomato stems and their production of the emanation causing leaf epinasty, F. E. Denny (*Contrib. Boyce Thompson Inst., 8 (1936), No. 1, pp. 99–104, figs. 3*).—"The horizontal position toward gravity was found to be more effective than the vertical in causing the production by tomato stems of volatile products inducing epinasty of potato leaves in a manner similar to that resulting from low concentrations of ethylene."

Effect of growth substances on the rooting response of cuttings, A. E. Hitchcock and P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 8 (1936), No. 1, pp. 63–79, figs. 4*).—Treatment of cuttings or shoots of *Ilex, Taxus, Pachysandra, Hibiscus, Acer*, and *Crysanthemum* with indoleacetic, indolepropionic, indolebutyric, or napthaleneacetic acid preparations induced earlier rooting, increased the number of roots, and caused the roots to emerge from a larger area of stem tissue than in controls. Placing the basal ends of cuttings in a tap water solution of growth substance was especially effective on *Ilex, Taxus, Hibiscus*, and *Pachysandra*. It is believed that this method is better adapted to initiating root growth than the use of lanolin preparations. For like concentrations, aqueous solutions were from 100 to 500 times more effective than lanolin preparations. Indoleacetic, indolebutyric, and naphthaleneacetic

acids were effective over a concentration range of 10–20 times with treatment periods of 6–96 hr. A 24-hr. treatment with solutions containing 4–20 mg of indoleacetic acid per 100 cc or 2–10 mg of either indolebutyric or naphthaleneacetic acids per 100 cc was effective for several plant species. Solutions containing 1–4 mg per 100 cc were equally effective with 2–4 days' treatment. Lanolin preparations of indoleacetic or indolepropionic acids (30–100 mg per gram of lanolin) were consistently effective on *A. palmatum* but not on many other woody species tested during the spring and summer of 1935. Preparations most effective in stimulating root formation also retarded the growth of nondormant buds.

Effect of light and dark on responses of plants to growth substances, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 8 (1936), No. 3, pp. 217–231, figs. 3*).—Using α-naphthaleneacetic, indoleacetic, indolebutyric, indolepropionic, and phenylacetic acids, and the methyl and ethyl esters of these acids, the degree of response due to growth acceleration varied with the conditions under which the plants were grown, those in bright light tolerating higher concentrations and making less response than similar plants in deep shade. Plants in light treated with low concentrations of these substances made maximum growth responses in 6–10 hr., and then the leaves and stems tended to recover. Plants transferred to the dark at the time of treatment showed more pronounced responses than those in the light, and the treated parts did not tend to recover. Prolonged dark periods caused the plants to become more sensitive to these substances.

Lanolin plus 1 percent of the growth substances caused pronounced negative responses in the light but induced positive responses in the dark. The latter plants, however, exhibited negative bending soon after transference back to the light. Tomato stems 5 in. high lost their capacity to respond to gravity after 5 days in darkness during December, but larger plants lasted for a longer period. After losing their capacity to grow away from the center of gravity the plants still were able to respond to growth substances, but after a few more days in the dark they lost this capacity also. Tobacco plants 18 in. high retained their capacity to respond to both gravity and growth substances for 30 days in darkness. Potato, artichoke, and dahlia plants grown in the dark from the first produced etiolated stems which retained their capacity to respond to gravity and growth substances for 60–80 days after planting. Similar plants grown first in the light to a height of 12–18 in. and then transferred to darkness did not retain their capacity to respond as well as those grown in continuous darkness. Adventitious roots were induced on tobacco, artichoke, and potato plants while in darkness, though such roots did not continue to grow as well as those induced in the light.

Permanent wilting of leaves, decrease in carbohydrates, and increase in nitrates in the tissues were associated with loss of the capacity of tomato plants to respond to gravity and to growth substances while in darkness.

Comparative effectiveness of acids, esters, and salts as growth substances and methods of evaluating them, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 337–350, figs. 4*).—This paper gives a brief review of responses of plants to growth substances, a discussion of methods used for testing purposes, and the results obtained with 21 salts prepared from the various acids previously reported as growth substances. The salts were much more soluble than, and in general as effective as, their corresponding acids. To compare the physiological effectiveness of the salts and acids, special attention was paid to their capacity for accelerating local growth and for inducing root formation on intact plants and cut-

tings. An improved sample of α-naphthaleneacetic acid proved more effective than the acid previously reported. It compared favorably with indoleacetic acid for inducing bending responses and was several times as effective as the latter in inducing root formation on intact plants. Indolebutyric and naphthaleneacetic acids and their salts in water solutions were the most effective root-inducing substances for cuttings. With concentrations representing the upper limits, the salts were slightly less toxic than the acids. The salts were also slightly less retarding than the acids for growth of aerial roots on tropical grape (*Cissus*). Aerial roots of *Cissus* which do not normally grow secondary roots were induced to form adventitious roots when treated with lanolin preparations of the various salts. Data furnished by Avery, Burkholder, and Creighton as noted above are also included as showing that several substances supplied by the authors' laboratory were highly effective on *Avena*.

This report indicates that the acids which have been found effective as growth substances can have the hydrogen of the carboxyl group replaced by an organic or inorganic base without destroying their activity. The need for several technics and test objects is discussed.

The movement of assimilate in seedling tomato plants, B. D. Bolas and I. W. Selman (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 21 (1935), pp. 82–84*).—The experimental results led to the inference that the greater part of the assimilate movement out of the leaf system into the stem and roots occurs during the assimilation period rather than at night, and that the respiration rate of the roots is disproportionately high in winter.

Hydrogen ion concentration and ascus formation, L. B. Lockwood (*Mycologia, 29 (1937), No. 3, pp. 289, 290*).—*Aspergillus herbariorum* ser. *minor*, *Penicillium javanicum*, and *Chaetomium globosum* grown on synthetic media at various pH values produced the highest percentage of ascus-bearing perithecia toward the alkaline range.

On the relation between respiration and fermentation in yeast and the higher plants, J. S. Turner (*New Phytol., 36 (1937), No. 2, pp. 142–169, figs. 3*).—This is a review of present knowledge of the effect of iodoacetate on the metabolism of plants, with about two pages of literature references. The two opposed theories of the relation between respiration and fermentation are discussed, and it is indicated how work with iodoacetate may lead to a discrimination between them. It is deemed probable that iodoacetate inhibits fermentation by direct action on the first stage of fermentation (triosis). Its action is more rapid than oxidation. It is believed that iodoacetate, by inhibiting triosis, inhibits both fermentation and respiration. Further evidence regarding the respiratory quotient and the respiration following fermentation is also discussed.

The influence of nodule bacteria and the Azotobacter on the yield of leguminous and cereal plants sown together, T. T. Demidenko and E. F. Timofeeva (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 14 (1937), No. 4, pp. 231–233*).—On the basis of the data obtained from mixed sowings it is concluded that the nodule bacteria supply nitrogen not only to the legume (peas), but also to oats grown in the same soil, the peas contributing to the development of the oats by yielding to them some of the nitrogen assimilated by the bacteria. When oats and peas were sown together and the soil was inoculated with a mixed culture of *Azotobacter* and the nodule bacteria, the net effect was favorable to the oats and somewhat depressing to the peas, at the expense of which, to some extent, the oats developed.

GENETICS

The designation of clonal generations, R. E. CARYL (*Science, 86 (1937), No. 2224, p. 156*).—In this brief note, the author suggests the use of the symbols C_1, C_2, etc., to designate the clonal generations in the same manner that F_1, F_2, etc., are used to designate filial generations.

Grass studies.—I, Chromosome numbers in certain members of the tribes Festuceae, Hordeae, Aveneae, Agrostideae, Chlorideae, Phalarideae, and Tripsaceae, E. L. NIELSEN and L. M. HUMPHREY (*Amer. Jour. Bot., 24 (1937), No. 5, pp. 276–279, figs. 23*).—This is a contribution from the University of Arkansas.

Artificially induced fatuoids in a dwarf mutant oat, R. A. DERICK and R. M. LOVE (*Sci. Agr., 17 (1937), No. 11, pp. 703–706, fig. 1*).—The appearance of a dwarf fatuoid oats form from X-rayed material is reported and certain genetic and cytological observations related to its origin.

Inheritance and breeding of cattle, I. JOHANSSON (*Ärftlighet och husdjursavel. Stockholm: Lantbr. Tidskr. A.-B., 1937, pp. 175, figs. 76*).—A presentation of the inheritance of characters in animals.

A study of mutations in evolution.—IV, Ontogeny of the equine foot, R. C. ROBB (*Jour. Genet., 34 (1937), No. 3, pp. 477–486, fig. 1*).—Continuing this series (E. S. R., 77, p. 177), data are presented on the length of the digits of extinct and modern horses and compared with measurements of the digits of fetal stages of the modern horse.

Contribution to the chromosome map of Gallus domesticus.—II, Linkage relation of the genes Sune and Todi, A. B. AFONIN (*Biol. Zhur., 5 (1936), No. 5, pp. 885, 886; Eng. abs., p. 886*).—Crossing-over between the dominant gene for feather color, *Todi*, and the linked recessive gene, *Sune*, affecting crest, was found to be 17.2 percent.

Linkage tests with the yellow-head and dominant-white plumage and white-skin characteristics in domestic fowl, A. DEAKIN and G. ROBERTSON (*Sci. Agr., 17 (1937), No. 7, pp. 451, 452*).—The backcross progeny produced in matings of double heterozygotes with double recessives showed no linkage between the genes for yellow-head (E. S. R., 73, p. 767) and yellow-skin and dominant-white or their allels in the fowl. The appearance of the yellow-head character was dependent upon the presence of the gene *g* and the yellow-skin gene *w*. The yellow-head factor affected the vascularization of the head furnishings, causing pale-colored heads, in the absence of *w*.

Glutathione concentration and hereditary size.—VI, Comparative post-hatching studies with Barred Plymouth Rocks and White Leghorns, P. W. GREGORY, H. GOSS, and V. S. ASMUNDSON (*Growth, 1 (1937), No. 1–6, pp. 89–102, figs. 4*).—Continuing this series from the California Experiment Station (E. S. R., 76, p. 322), the glutathione and ascorbic acid concentrations of whole carcasses of 84 pairs of White Leghorn and Barred Plymouth Rock chicks from 2 to 14 days of age were compared. The Rocks consistently had a greater glutathione concentration than the Leghorns, and except for from 2 to 4 days of age had a greater weight. The Leghorns showed a consistently higher concentration of ascorbic acid.

Growth rates of successive feathers from single follicles in the juvenile Brown Leghorn, M. JUHN (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 777–780, figs. 2*).—Study of the growth rates and pigmentation of successive feathers from the same follicle in Brown Leghorns showed the specific pigmentation pattern of a given feather to be a function of its rate of growth.

The growth and proportions of the rabbit's ear in relation to body weight, G. DUNLOP and J. HAMMOND (*Jour. Genet., 34 (1937), No. 3, pp. 463–475, pl. 1, figs. 6*).—Comparison is given of the actual body weights and ear lengths and rates of growth of these parts in three inbred strains of rabbits and crosses and backcrosses between them. Maximum ear length was attained earlier than maximum body weight. It was noted that the maximum rate of maturity in body weight was attained earlier in small breeds than in large breeds. The ratio of body weight to ear length served as an index of body proportions. Changes in the ratio were more closely associated with weight than with age. In crosses the proportions of the body were intermediate but they were much affected by nutritional conditions.

Germinal response (in male mice) to environmental conditions, C. L. OGLE (*Amer. Jour. Physiol., 117 (1936), No. 2, pp. 285–291, figs. 7*).—In a study on the testes of male mice, histological examination was made of animals, killed at comparable ages, which had been grown at temperatures of from 60° to 68°, 70° to 80°, and 88° to 92° F. The colder temperature proved most satisfactory as regards the proliferation of germinal epithelium. Humid heat caused a suppression of fertility and of germinal activity.

Development of the mammary gland of the rat: A study of normal, experimental, and pathologic changes and their endocrine relationships, E. B. ASTWOOD, C. F. GESCHICKTER, and E. O. RAUSCH (*Amer. Jour. Anat., 61 (1937), No. 3, pp. 373–405, pls. 5*).—The postnatal development of the mammary gland in the rat is described, including a study of the influence of operative procedures, endocrine substances, and nutritional disturbances. Evidently, the gonads are without effect during the first 6 weeks' development, but after sexual maturity changes in the female accompany periodic stages of the oestrous cycle, and moderate doses of oestrin accelerate extension of the duct tree as the animal approaches maturity. Gonad-stimulating substances cause mammary development characteristic of pregnancy, with lactation following ovariectomy. Hypophysectomy and dietary deficiency are both followed by cessation of mammary growth and regression.

Ovaries secrete male hormone.—I, Restoration of the castrate type of seminal vesicle and prostate glands to normal by grafts of ovaries in mice, R. T. HILL (*Endocrinology, 21 (1937), No. 4, pp. 495–502, fig. 1*).—Ear grafts of ovaries in castrate mice were found to restore the seminal vesicles and prostate glands to normal and stimulated mammary gland development, suggesting the secretion by the ear-grafted ovaries of the male hormone. Scrotal and ear temperatures were similar, suggesting the role of temperature in the formation of this hormone.

Male hormone and the testis-comb relationship in the chick, W. R. BREneman (*Endocrinology, 21 (1937), No. 4, pp. 503–510*).—Injections of dihydroandrosteronebenzoate and testosterone for 5 days into from 5- to 10-day-old chicks caused immediate cessation of gonad growth, but the gonads of month-old chicks that had been treated in the same manner were 90 percent heavier than their controls. The amount of comb growth was correlated with the gonad weight.

The comb of the baby chick as a test for the male sex hormones, R. T. FRANK and E. KLEMPNER (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 763–765, fig. 1*).—A method is described for detecting the male sex hormone by applying 10 daily doses of the hormone in 1/20 cc of oil with a blunt hypodermic needle along the base of the comb of 6-day-old chicks. Comb weights were markedly increased as a result of treatment with androsterone.

The action of synthetic male hormones upon the differentiation of sex in the chick embryo, B. H. WILLIER (*Science, 86 (1937), No. 2236, p. 409*).—Solutions of synthetic male hormones introduced into embryos, potentially female, at from 48 to 72 hr. of incubation caused hypertrophy of the right gonad to a testis-like body, and the left ovary also assumed testis-like form. In male embryos testosterone propionate only reduced the size of the testes, whereas androsterone and dehydroandrosterone had strong feminizing action.

The effects of hypophyseal implants from normal mature guinea pigs on the sex organs of immature guinea pigs, I. G. SCHMIDT (*Endocrinology, 21 (1937), No. 4, pp. 461–468*).—Subcutaneous implantations of hypophyses from mature female guinea pigs (400–700 g), removed at different times during the oestrous cycle, on the abdomen of immature females (190–210 g) were found to have different effects on the recipients. Maximum follicle stimulation and oestrus followed the implantation of glands removed from 11 to 15 days after the donors passed oestrus, and there was no noticeable effect from hypophyses removed during oestrus. No ovulation occurred. Hypophyses from male donors were most active in that they caused ovulation, corpus luteum formation, and marked oestrous changes in the uterus and vagina.

The effects of hypophyseal implants from guinea pigs with irradiated ovaries on the sex organs of immature guinea pigs, I. G. SCHMIDT (*Endocrinology, 21 (1937), No. 4, pp. 469–475*).—Implantations in immature animals of hypophyses removed from females which had received minimum sterilization doses of X-rays caused variable results in the recipients similar to the responses noted in the preceding paper, but a few were more potent in producing follicular growth and corpus luteum formation, as was observed from the male implants.

The specificity of progesterone in inducing sexual receptivity in the ovariectomized guinea pig, R. HERTZ, R. K. MEYER, and M. A. SPIELMAN (*Endocrinology, 21 (1937), No. 4, pp. 533–535*).—Crystalline progesterone and oestrin-free extracts of sow corpora lutea induced the copulatory reflex in theelin-conditioned guinea pigs, but seven steroids closely related to progesterone failed to induce sexual receptivity.

Maintenance of spermatogenesis in testis of the hypophysectomized rat with sterol derivatives, W. O. NELSON and C. MERCKEL (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 825–828*).—Various crystalline androgens—testosterone, androsterone, dehydroandrosterone, androstanedione, androstenediol—and oestrone, and oestrone and androstanedione maintained spermatogenesis in hypophysectomized rats if treated soon after removal of the hypophysis, but their capacity was unrelated to the male hormone activity. Spermatogenesis could not be reinitiated with these substances.

A study of the augmentation of ovarian weights as effected by zinc sulphate, Antuitrin S, and thyroid implants, F. E. EMERY (*Amer. Jour. Physiol., 118 (1937), No. 2, pp. 316–320*).—Increases in the ovarian weights of rats ranging up to 372 percent were induced by the intraperitoneal administration of Antuitrin S with zinc sulfate or with pituitary implants.

Relation between thyroid and growth of testes and penis when stimulated by electric light, J. BENOIT (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 782–784*).—Observations on Pekin ducks showed that after from 32 to 34 days of light treatment, thyroidectomy markedly inhibited the growth of the testes, as contrasted with controls, but the inhibition was diminished after 37, 41, and 61 days. Anterior hypophyses from normal ducks treated with light were rich in the gonadotropic factor, but the hypophyses of the thyroidectomized ducks similarly treated were low in this factor. Thyroidectomy exerted an inhibitory effect on the development of the penis.

Effect of oestrone on hypophyses and reproductive organs of thyroidectomized rats, W. O. Nelson and J. Hickman (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 828–830*).—Studies of the reaction of the hypophyses and reproductive organs of normal and thyroidectomized rats to oestrone led to the conclusion that the basophiles forming in the pituitary after castration and thyroidectomy are of the same type but react differently to castration and thyroidectomy.

Augmentation of the gonadotropic hormone from the pregnant mare, A. Lein (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 609–611*).—The administration of pituitary extract, which alone had no effect on ovarian weight, when administered with pregnant mare serum caused increases in the weight of the ovaries of 1-day-old immature mice from 4.3 mg, produced by the serum alone, to 9 mg. Heating the pituitary extract destroyed its power to augment the action of the pregnant mare hormone. Muscle extracts showed no augmentative powers, and therefore the augmentation of the gonad-stimulating hormone by the pituitary is considered due to hormonal action rather than to the presence of inert materials.

Superfecundity in rats treated with mare gonadotropic hormone, H. H. Cole (*Amer. Jour. Physiol., 119 (1937), No. 4, pp. 704–712, figs. 3*).—In studies at the California Experiment Station, 155 mature and 288 immature rats were injected with varying doses of gonadotropic hormone from pregnant mare serum. Fecundity in the mature animals was related to the stage of the oestrous cycle when the injections were made, as well as the size of the dose. The average litter size and percentage of large litters were increased in mature animals injected with 12 rat units of hormone in metoestrum, but no litters were bigger than the largest litter found in the controls. Litters as large as 28 were observed implanted in immature rats treated with from 6 to 10 rat units of the hormone, but the largest number born in a single litter was 17 living young.

Oestrogenic treatment of hypophysectomized male mice, E. T. Gomez, C. W. Turner, W. U. Gardner, and R. T. Hill (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 287–290*).—The mammary glands of male hypophysectomized mice did not respond to the administration of theelin, but if a small amount (2 percent or more) of the pituitary remained, essentially the same response was found as in normal animals. However, regression of the gonads, accessories, and adrenal cortex was not prevented.

Growth of mammary gland of hypophysectomized guinea pig, E. T. Gomez, C. W. Turner, and R. P. Reece (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, p. 286*).—As it was found impossible to stimulate the growth of the mammary gland of hypophysectomized guinea pigs by oestrogen administrations (E. S. R., 76, p. 465), tests were made with hypophysectomized males which received 20 daily implants of male rat pituitary from donors injected for from 10 to 20 days with 100 units of theelin. Development of the nipples and duct system occurred comparable to that of normal males following theelin injection. Action of the oestrogens on the mammary glands seemed to be by way of the female pituitary.

Effective stimulation of crop-sacs by prolactin in hypophysectomized and in adrenalectomized pigeons, J. P. Schooley, O. Riddle, and R. W. Bates (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 408–411*).—Proliferation of the crop sacs and frequently crop milk formation were induced in 4 days in 20 hypophysectomized immature and adult pigeons by prolactin administration. However, about 8 times the normal dose of prolactin was required. Adrenalectomy and thyroidectomy did not affect the response.

Effects of androgenic substances in the female rat, W. O. NELSON and C. G. MERCKEL (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 823–825*).—Differences in the effects of male hormone preparations on female rats are described. The results led to the conclusion that ovarian function is not entirely suppressed by hypophysectomy.

Effect of adrenotropic extract upon the accessory reproductive organs of castrated rats, C. S. DAVIDSON (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 703–705*).—Adrenotropic extract of the pituitary was found to have a stimulating effect on the prostate and seminal vesicles of castrated rats provided the adrenals were intact. The response was shown in hypophysectomized animals, and adrenal atrophy was also prevented.

Failure of progesterone to prevent resorption of embryos in rabbits castrated in very early pregnancy, W. M. ALLEN and G. P. HECKEL (*Science, 86 (1937), No. 2236, pp. 409, 410*).—Pregnancy could not be maintained in rabbits ovariectomized after mating by injections of purified, oestrin-free, progesterone-containing extracts of corpora lutea. Pregnancy was maintained by crude progesterone-containing extracts of corpora lutea or oestrin and progesterone administration.

Effect of pituitary hebin upon reproductive system of the chick embryo, L. V. DOMM and E. A. DENNIS (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 766–769, fig. 1*).—Injections from the second to the sixteenth day of incubation of from 5 to 30 rat units of pituitary hebin caused hypertrophy of the gonads and especially the right rudimentary gonad in females. Treated females showed medullary hypertrophy of the ovaries. Treated testes revealed a noticeable hypertrophy of interstitial tissue without change in the tubules. The larger doses administered at the early ages caused severe mortality.

Responses of feathers of male and female pheasants to theelin, C. H. DANFORTH (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 322–324*).—Studies of the effect of theelin injection on feather development in grafts on the rump of normal and gonadectomized male and female pheasants showed that, with all concentrations of theelin, female skin consistently produced feathers more nearly resembling the female type than male skin grafts.

Cellular changes in the anterior hypophysis with special reference to its secretory activities, A. E. SEVERINGHAUS (*Physiol. Rev., 17 (1937), No. 4, pp. 556–588, fig. 1*).—The cellular changes in the anterior lobe of the hypophysis associated with castration, pregnancy, and administration of the sex hormones are described.

The lactogenic and thyrotropic hormone content of the anterior lobe of the pituitary gland, R. P. REECE and C. W. TURNER (*Missouri Sta. Res. Bul. 266 (1937), pp. 104, figs. 10*).—Studies based on determination of the amounts of the lactogenic and thyrotropic hormones in the anterior lobes of hypophyses removed from about 500 cattle pituitaries and the pituitaries of many laboratory animals are presented. These results, in addition to giving the variations in the weights of the pituitaries with age, breed, and sex, show that more lactogen was present in the pituitaries of females than of males, and the concentration increased with age in both sexes. Per unit of weight, fresh anterior lobe tissue from dry and open, lactating and open, and lactating and pregnant dairy cows contained about 70 percent more lactogen than the pituitaries from beef cows in the corresponding condition. Dry and pregnant dairy cows showed the presence of 37 percent more lactogen than dry and pregnant beef cows.

Species differences were observed in the lactogen content of the pituitary glands per unit of weight in the different laboratory animals. The descending order of concentration for females was: Dairy cow, guinea pig, beef cow, rat, rabbit, mouse, cat in oestrus, and cat in anoestrus. Following parturition, the lactogen content of the pituitary glands from rats and guinea pigs was more than doubled, as compared with normal animals. Although castration of the male or abdominal anchorage of the testes did not influence the lactogen content of the gland, ovariectomy of females caused a marked decrease. Injections of oestrogens into ovariectomized female rats and normal and castrated male rats and male guinea pigs increased the lactogen content of the glands. However, large doses caused decreased milk secretion in lactating rats. The tests were carried out by assaying suspensions of the dried gland through intradermal injections in a limited area of the crop gland of pigeons.

The thyrotropic hormone content of the anterior pituitaries was determined by the increase in weight of the thyroid glands of male guinea pigs. The amounts of this hormone assayed per unit of weight of anterior lobe tissue ranged in cattle from a maximum in from 11- to 23-month-old heifers, 1 to 140 days pregnant, to a minimum in from 11- to 23-month-old steers.

The influences of other conditions on the lactogenic and thyrotropic hormone contents of the glands are pointed out, some of which have been previously noted from other sources (E. S. R., 77, pp. 179, 322).

An extensive bibliography is appended.

Experimentally altering galactin content of the rat pituitary, R. P. Reece and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 283–285*).—Continuing studies involving modification of the galactin content of the pituitary gland of rats at the Missouri Experiment Station (E. S. R., 76, p. 466), the daily injection in ovariectomized rats of Progynon-B for from 6 to 14 days produced the greatest increase, but some increase also followed ovariectomy for 18 days, with or without the hormone administration or theelin. Oestrogens do not cause galactin storage or prevent secretion during pregnancy.

Response of anterior pituitary of immature castrated rat to testosterone and related compounds, J. M. Wolfe and J. B. Hamilton (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 307–310*).—Injections of testosterone, testosterone-propionate, and testosterone-acetate for 10 days into male and female rats immediately after gonadectomy suppressed the increase in the number and size of the granular basophile cells which appeared in the pituitaries of the controls. There was little change in the eosinophiles or chromophobes present. No increase in the weight of the pituitaries was produced as in the case of oestrin administration.

Augmentation of gonad stimulating hormone of the hypophysis by copper, F. E. Emery (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 731–733*).—The ovaries of 38-g rats were not significantly different in size 5 days after implantation with one pituitary in the abdomen, with or without small daily doses of copper sulfate. The organs were significantly larger when two rat pituitaries were implanted, but again the copper was without synergistic effect.

Gonadotropic hormones of the hypophysis of the turkey, E. Witschi, A. J. Stanley, and G. M. Riley (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 647–651, figs. 2*).—Results are reported on the injection of 21-day-old rats with dry pituitary powder from turkeys. A water solution of 100 mg produced large ovaries with many corpora lutea and mature follicles. A dose of 50 mg caused increases in the size of the ovaries, due principally to increased

numbers of follicles. The ovarian weight was only slightly increased by the few enlarged follicles by the administration of 25 mg of the pituitary powder, and no changes were observed from 10 mg. The larger doses also caused enlargement of the uteri, but the vaginas remained closed. In a second test with 28-day-old rats, the ovaries were larger and the vaginas opened after 100 mg and 50 mg injections. Further tests on hypophysectomized rats showed the presence of the luteinizing hormone, as well as the follicle-stimulating hormone, in the turkey hypophysis. Large doses of the turkey pituitaries caused marked hypertrophy of the testes, ovaries, and oviducts of sexually quiescent sparrows.

The antigonadotropic factor, B. Zondek and F. Sulman (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 708–717*).—Two papers are presented, as follows:

Origin and preparation (pp. 708–712).—The amount of antigonadotropic factor in the blood serum of normal and castrated male and female rabbits treated with 250 rat units of prolan four times a week was increased to a maximum of 150 prolan antiunits per cubic centimeter after 26 weeks. None of the antigonadotropic factor was present in the urine, liver, spleen, or musculature.

Species specificity and organ specificity (pp. 712–717).—Experiments on species and organ specificity suggested the operation of two kinds of gonadotropic antihormones. One is formed in the blood following protracted treatment with a heterologous gonadotropic hormone independent of the species, sex, or sexual function and is species and organ specific. The other is formed in the nontreated organ and is unspecific to species and organ.

A rabbit ovulation test for equine pregnancy, J. J. Arnold (*Vet. Med., 32 (1937), No. 7, pp. 324–327, pl. 1*).—A brief account is given of rabbit ovulation tests for equine pregnancy, based on the administration of from 4 to 10 cc of blood serum, which gave satisfactory results between 45 and 90 days after service.

Medium of vagina in relation to the sex of the offspring in sheep, M. K. Kardymovitš (Kardymowicz) (*Biol. Zhur., 5 (1936), No. 5, pp. 915–926, figs. 3; Eng. abs., pp. 925, 926*).—Study of the vaginal cervical secretions of 633 ewes showed that at the beginning of oestrus the reaction was first alkaline, changing to acid at the end of the period. If insemination occurred when the pH was 5.5 or lower, 66.7 percent of the lambs were males. If the pH was above 7.75, 85.7 percent of the lambs were ewes. Artificial modifications in the acidity of the secretions were unsuccessful in altering the sex ratio.

Sexing turkeys from hatching to maturity, J. C. Hammond and S. J. Marsden (*Poultry Sci., 16 (1937), No. 4, pp. 287, 288, fig. 1*).—The presence of the genital papillae in males and its absence in females serves to determine the sex of poults at any age.

The female genital eminence is not a measure of future egg production, J. C. Hammond and W. H. Burrows (*Poultry Sci., 16 (1937), No. 4, pp. 285, 286*).—Classification was made of 2,609 day-old female Rhode Island Red and crossbred Rhode Island Red and Barred Plymouth Rock chicks as to presence or absence of the genital eminence at the U. S. D. A. Research Center, Beltsville, Md. There was no relation of the size and type of the eminence to adult mortality, age at sexual maturity, rate of laying, persistence, broodiness, fertility of eggs, or hatchability of fertile eggs.

FIELD CROPS

[Agronomic experiments in Montana] (*Montana Sta. Rpt. 1936, pp. 14–18, 30, 31, 39, 40, 42–44, 45–47, fig. 1*).—Experimentation with field crops, for

which results are given briefly, was concerned with breeding work with wheat, corn, and field beans; variety tests with wheat, oats, barley, corn, potatoes, field beans, alfalfa and forage grasses, and sorghums; milling and baking studies with wheat; seed value of light weight wheat; merits of plowless fallow and continuous corn; soil moisture and tillage investigations; crop rotations on dry land and under irrigation and variously fertilized; relation between climatic factors and small grain yields; heavy v. light applications of phosphorus for potatoes, and fertilizer as a factor influencing storage and handling qualities; hog pasture; value of crested wheat for pasture and regrassing abandoned land, and germination tests with its seed and other crop seed; and weed control by farming practice. Certain phases of the work were in cooperation with the U. S. Department of Agriculture.

[Field crops research at the Puerto Rico College Station], P. Richardson Kuntz, J. Pastor Rodríguez, E. Molinary Salés, F. Méndez, and L. A. Serrano (*Puerto Rico Col. Sta. Rpt. 1936, pp. 16–25, 73–80, 82–84, 85–89, 90, 114–119, 123, 124*).—Experiments with field crops (E. S. R., 77, p. 771) again reported on from the station and the Isabela Substation comprised variety, spacing, cultivation, irrigation, fertilizer, trash disposal, and green manuring (*Crotalaria striata*) tests, all with sugarcane; fertilizer, spacing, and breeding work with cotton; improvement of pigeon peas; fertilizer tests with corn, native beans, yams, and potatoes; and variety trials with tobacco, soybeans, native beans, and legumes for cover crops.

Macrosporogenesis and embryo-sac development in Euchlaena mexicana and Zea mays, D. C. Cooper (*Jour. Agr. Res. [U. S.], 55 (1937), No. 7, pp. 539–551, figs. 4*).—That the ovule development, macrosporogenesis, and the formation of the macrogametophyte are essentially similar in the annual variety of Florida teosinte, yellow dent corn, and the corn-teosinte hybrid was observed in Wisconsin Experiment Station studies. Each ovule contains a single archesporial cell which functions as the macrospore mother cell. In consequence of the two meiotic divisions, a row of four macrospores is produced, of which the chalazal spore becomes the embryo sac mother cell and the others disintegrate. Cell plates are formed across the telophase spindles of the second nuclear division producing a three-celled embryo sac. A third nuclear division followed by cell plate formation leads to an eight-nucleate, seven-celled structure. The antipodal cells continue to divide so that from 30 to 40 such cells are present at maturity. Fertilization occurs in teosinte between 15 and 20 hr. after pollination. At this time the ovule is amphianatropous in form. The synergids are not disorganized at the time of fertilization but persist for 4 or 5 days thereafter and then disintegrate.

The effect of soil moisture, hardening, endosperm condition, and variety on the frost reaction of wheat, oat, and barley seedlings, A. W. Platt (*Sci. Agr., 17 (1937), No. 10, pp. 616–626; Fr. abs., p. 626*).—Hardened and unhardened wheat plants were grown at the University of Alberta in soil maintained at 50 percent—and subjected to freezing temperatures in soil maintained at 20, 50, and 65 percent—of its moisture-holding capacity. The survival was directly related to moisture content. The relative varietal reaction was the same at each of the different moisture contents. Survival of plants hardened for 12 hr. was influenced less by variations in moisture content than was that of unhardened plants. When plants were grown in sand and in soil maintained at 30, 45, and 60 percent—and exposed to −12° C. for 4 hr. at 60 percent—of the moisture-holding capacity of the substrate, their survival values were not significantly different. Wheat varieties were hardened for 36, 24, 12, and 0 hr. at 0° and then exposed to −10° for 4 hr. Hardening markedly increased the

frost resistance of the varieties concerned, and the relative varietal reaction was the same in each hardening treatment. Survival indices of plants grown from normal, slightly frozen, severely frozen, and seed from which part of the endosperm had been removed were essentially similar.

Varieties of wheat and also oats and barley varieties were found to vary distinctly in reaction to freezing temperatures in the seedling stage. The relative reactions of certain barleys depended upon the freezing temperatures to which they were exposed, but such differential responses were not found among the wheats tested. The early-maturing varieties of cereals tested were found to be relatively susceptible to frost injury in the seedling stage.

Terminology on photoperiodism and vernalization, A. E. MURNEEK (*Jour. Amer. Soc. Agron., 29 (1937), No. 4, p. 332*).—A Missouri Experiment Station contribution defining 13 terms.

Enzyme activity in cold-hardened and unhardened red clover, G. A. GREATHOUSE and N. W. STUART (*Plant Physiol., 12 (1937), No. 3, pp. 685–702*).—The results of a study made at the Maryland Experiment Station (E. S. R., 75, p. 476) on the autolysis of red clover root and crown tissue when in the cold-hardened and unhardened condition suggested that the adaptability of the red clover plant to winter conditions is associated closely with its rate of carbohydrate metabolism. The enzymes active on starch in the less hardy French variety could hydrolyze a greater proportion of the starch in a given period than could those in Ohio red clover. The proteolytic enzymes in the Ohio clover roots were more active than those in the French clover roots, while reverse relationship existed for proteolytic enzymes in the crown tissue. Heating macerated clover tissue to 70° C. for 1 hr. did not destroy the carbohydrate and proteolytic enzymes, although accumulation of sugars and nonprotein nitrogen was not so great as in the untreated samples. Enzymes in the French red clover were injured more than those in the Ohio variety by heating. This protected enzymatic activity was correlated with larger percentages of sugar and amino nitrogen in the Ohio than in the French clover. Exposure of tissue to −22° for 1 hr. before autolysis did not greatly influence the enzymatic activity as compared with the check.

Corn production on the Campbell County Experiment Farm, P. K. THOMPSON (*Wyoming Sta. Bul. 223 (1937), pp. 11*).—Corn investigations near Gillette, 1927–36, considered the merits of varieties, seedbed preparations, time and methods of planting, and differently spaced rows.

Varietal leaders have included Falconer, Gehu, Minnesota 23, and a local white dent. Indications were that hardy flint and dent varieties that mature from early to midseason ripen and yield well. Spring seedbed preparations usually produced higher average yields than seedbeds prepared in the fall, fall plowing resulting in the lowest yields of all preparations tested. Early spring plowing outyielded early spring disking. Deep spring plowing did not increase yields enough over ordinary plowing to pay the extra cost. Corn planted from June 1 to 15 outyielded that planted from April 15 to May 15 and needed fewer cultivations. Furrow-planted corn yielded higher than surface-planted or listed corn. Regularly spaced (42-in.) corn rows gave higher yields than wider spacings in the years of normal rainfall, but in drought years 84-in. rows yielded as much as regular rows and in those years winter wheat following 84-in. rows made larger yields than after 42-in. rows.

Composition of mature corn stover as affected by variety, soil type, and fertilizer treatment, D. C. WIMER (*Illinois Sta. Bul. 437 (1937), pp. 173–272, figs. 13; abs. ed., pp. 23*).—Mature stover from 15 varieties of corn, early to late maturing, grown on 15 soil types under 21 soil treatments was collected

in 1928 from 16 experiment fields in Illinois. The soils ranged from very low to high in productivity, and the soil treatments varied from 0 to full treatment with crop residues, limestone, rock phosphate, and kainite, supplemented with a complete fertilizer. The composition of each stover sample reported was based on separate analyses of stalks and leaves and the proportion that each part was of the whole sample. Nitrogen, phosphorus, potassium, and calcium were considered primarily, however organic carbon and total ash were also determined.

The nature and extent of modifications in composition and yield with changes in environment appeared to vary greatly with variety, although the response of different varieties similar in time of maturing may be decidedly different. Varieties also might differ markedly in composition of mature stover owing to differences in feeding power or in ability to translocate nutrients to grain, or both. In these tests the amount of nitrogen in mature corn stover of different varieties usually exceeded the potassium, which surpassed calcium and phosphorus in order. The marked differences in the nitrogen, phosphorus, and potassium percentages contrasted with the rather uniform calcium content. Stover composition was affected greatly by yields, but there appeared to be slight relation between composition of stover from different varieties and their relative length of season. The total amount per acre of the various nutrients in stover was reflected more definitely by stover and grain yields than by merely the stover composition. The nitrogen content of leaves usually exceeded that of stalks, which, however, generally contained more phosphorus, except where grain yields were low, in which case the leaves were less depleted of phosphorus.

Soil type in the two possible comparisons had practically no direct effect on the composition of mature corn stover, although it exerted a marked influence on yields. On each field stover and grain yields were greater on the more-fertile and less-acid soil, which was higher in available phosphorus.

On most fields residues increased yields of grain and stover, usually with definite reductions in the phosphorus content of stover and also for nitrogen. On fields where sweetclover was grown on the unlimed residues plat the nitrogen content rose significantly. With potassium and calcium, definite changes in composition of stover were shown in most comparisons between residues and check samples. In general, limestone tended to raise the nitrogen, phosphorus, potassium, and calcium contents of stover and to increase stover and grain yields. The chief exceptions were in stover yields on soils naturally rich in carbonates. Rock phosphate, used in addition to residues and limestone, increased yields only slightly, although nitrogen and phosphorus percentages in the stover rose considerably. Potash, chiefly as kainite, increased yields on all fields except those with heavy dark-colored soils, raised the potassium content of stover from 13 to 160 percent, reduced the percentages of both nitrogen and phosphorus, and left the calcium content either less or unchanged. With few exceptions, all soil treatments increased both stover and grain yields above no treatment. The most pronounced changes in composition of stover, due to the combined treatments, were in nitrogen content, followed in turn by potassium, phosphorus, and calcium.

The form of phosphorus used on the treated plats markedly affected the phosphorus content of stover. On soils treated with rock phosphate the phosphorus content of the stover usually was much less than where superphosphate was used, but rock phosphate generally was the more effective in increasing yields. Use of limestone seemed less favorable for the utilization of rock phosphate than of superphosphate, yet heavy liming appeared in most

cases to retard but slightly the availability of rock phosphate. The possibility of such action appeared to bear a definite relation to the character of the soil and to the proportions of rock phosphate and limestone applied. Yields were increased on Grundy silt loam at Aledo by three phosphate forms but not by slag, whether used with limestone or without it. Stover from these plats contained from two to four times as much phosphorus as that grown without phosphate. When the superphosphate and slag phosphate were used with limestone, the percentage of phosphorus in the stover was much greater than when these phosphates were used without limestone.

Gypsum used with residues, limestone, and rock phosphate, and at the same rate as the phosphate, resulted in no yield increase and caused marked reduction in the phosphorus content of stover, especially with light applications of gypsum and rock phosphate. A 5–15–5 fertilizer as a supplement to the standard treatments usually increased yields and calcium content of stover, resulted in marked reductions in the nitrogen content, and usually did not change the phosphorus or potassium contents.

Effect of fertilizers on some nitrogenous and other constituents of the cotton plant as separated by electrodialysis at different stages of growth, E. R. Collins and N. E. Rigler (*Soil Sci., 44 (1937), No. 3, pp. 217–229, pl. 1, figs. 2*).—The roots and tops of cotton plants grown in Texas with and without fertilizers on Wilson clay loam near Elgin and Houston black clay near Greenville were analyzed periodically during the season by electrodialysis for nitrogen fractions, inorganic phosphate, and calcium.

The nitrogen fractions of the cotton plant reflected soil conditions and seasonal variations better than the total nitrogen. Ammonia nitrogen was relatively low in the plants throughout the growing period; amide nitrogen was also low during the earlier stages, but increased as the season advanced. Trends for total cathode nitrogen and for basic nitrogen, its principal constituent, were similar. The slight decline in early plant development was more noticeable in the tops, but the subsequent pronounced increase was more rapid in roots. The tops contained less amide nitrogen but more basic nitrogen and more phosphate than the roots. The nitrate content decreased from a relatively high concentration early in the season to a relatively low one during boll formation and subsequently maintained. The total anode nitrogen followed closely the trends of nitrate nitrogen. Plants on soils treated with high nitrogen fertilizers contained a greater concentration of all nitrogen fractions than those on untreated soils. The phosphoric acid concentration generally was in proportion to that in the fertilizer used. The concentration of calcium in the tops increased with plant maturity. The plant's calcium content was not affected materially by fertilizers on the soils.

Methods developed for preparation of samples of cotton plant material and procedures by electrodialysis technic adaptable to plant biochemical studies are given in detail. This method of separation of the nitrogen fractions largely eliminated interfering substances. A study of the rate of electrodialysis indicated that practically all of the ions are removed within 23 hr.

The effects of potash fertilizer on cotton in Louisiana, J. Y. Oakes (*Louisiana Sta. Bul. 291 (1937), pp. 11, figs. 6*).—Fertilizer experiments, 1930–34, under field conditions on several soil types, supported in part by a fellowship grant made by the N. V. Potash Export My., Inc., showed that certain Coastal Prairie soils and the lighter Coastal Plains soils of Louisiana are low in available potash. The lighter soil types appeared low in nitrogen, phosphorus, and potassium, and best results were obtained from potash when used in a balanced mixture. The Crowley soils seemed low in phosphorus and available potassium and

also to respond to completely balanced fertilizer. Control of cotton rust and wilt through use of potash fertilizers seemed in most cases to be correlated with or coincident to stimulation of vegetative growth and increased yields of seed cotton.

Potash starvation causes premature shedding of leaves, prevents proper development of bolls which may fail to open, makes cotton hard to pick, and often results in lint of inferior quality. Decreases in the length and percentage of lint where potash starvation occurs, it is said, can be corrected by use of potash fertilizer. Additional potash does not increase fiber length on soils containing potash enough for normal plant growth. Dry seasons appeared to decrease length of fiber and to encourage potash starvation.

Flaxseed production in the far Western States, A. C. Dillman and L. G. Goar (*U. S. Dept. Agr., Farmers' Bul. 1793 (1937), pp. [2]+22, figs. 10*).—Information on flaxseed production, gained largely in cooperation with the California Experiment Station, considers the history and cultural status of flax in the Pacific Coast States, varieties, cultural and harvesting practices, and control of flax diseases and insects.

Experiments with cover crops on Long Island, P. H. Wessels and J. D. Hartman (*[New York] Cornell Sta. Bul. 677 (1937), pp. 27, figs. 10*).—A study of the value of autumn and winter cover crops, made on Long Island, 1923–36, involved 11 different cover crop treatments each year, manure, and untreated plats. Rye, oats, wheat, and barley usually made good growth in the fall, but only rye, and to a lesser extent wheat, grew well in the spring.

Land with a rye cover crop over 8 yr. averaged 179 bu. of marketable Irish Cobbler potatoes per acre, with rye and vetch 178 bu., and 10 tons of manure 186 bu., compared with 156 bu. from plats without cover crops or manure. No other cover crop increased yield significantly. Sweet corn in 1935 benefited significantly from manure but not from any cover crop. Carrot yields in 1936 were increased by a rye cover crop but by no other treatment, manure not being applied. Vetch, alsike clover, Austrian winter peas, and crimson clover were unsatisfactory, chiefly because they made so little growth.

Organic matter in the soil averaged definitely higher in 1936 on rye, rye and vetch, manure, crimson clover and oats, and wheat plats than on untreated plats. The organic matter content of soil of individual plats was distinctly correlated with yields of carrots on those plats. It appeared that the soil nutrient supply may be increased by rye. Manured plats averaged highest in nitrate nitrogen and in available potash and second highest in available phosphoric acid on May 8, 1936, and untreated plats lowest in all these nutrients. No cover crop treatment changed soil acidity appreciably.

Recommendations are that rye should continue to be the choice for a cover crop on soil as acid as pH 5 to be sown after August 15 on Long Island. Growers are advised to seed rye in late summer and in the fall on all land not growing market crops.

Legumes in cropping systems, G. Roberts (*Kentucky Sta. Bul. 374 (1937), pp. 119–153*).—Findings by the staff of the agronomy department during reported and uncompleted investigations involving legumes in continuous culture and rotation, in pastures, in rotation experiments at the station and the Western Kentucky Substation, and in lysimeter experiments are reviewed, with discussion of the fixation, conservation, and utilization of nitrogen.

For vigorous growth to supply the requisite nitrogen for high yields of other crops, legumes may need additional mineral nutrients, especially calcium and phosphorus. Such conditions also are essential in producing crops of high nutritive value. With abundance of nutritious pasture and hay, live-

stock will require less grain feed and less land must be plowed for corn, thus protecting more soil against erosion and leaching. Where a considerable part of the farm is steep and subject to erosion, as much as possible of the steep land should be in pasture and hay crops, including legumes with the treatment favorable for vigorous growth. Under these conditions the necessary grain for feeds is best grown on the more level land, in short rotations.

Care in the use of lime for legumes is advised where tobacco is grown. While 1 ton of ground limestone per acre usually suffices, there is little danger from 2 tons if 4 or 5 yr. intervene between its application and the tobacco crop. Advantages of alfalfa for hay and the superiority of adapted red clover over seed from other domestic and foreign sources are also described.

Influence on grass growth of various proportions of peat in lawn soils, L. E. LONGLEY (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 649–652*).—Application of peat to a lawn before seeding at the Minnesota Experiment Station was found to depress the germination of the grass seed unless the peat was well moistened before application, but resulted later in a more luxuriant growth. A layer of about 2 in. of peat, regardless of type, was the best for lawn purposes. Heavier applications produce a soft, spongy lawn surface.

West Virginia pastures: Type of vegetation, carrying capacity, and soil properties, W. H. PIERRE, J. H. LONGWELL, R. R. ROBINSON, G. M. BROWNING, I. MCKEEVER, and R. F. COPPLE (*West Virginia Sta. Bul. 280 (1937), pp. 56, figs. 19*).—During a comprehensive study of permanent pastures in West Virginia, begun in 1935 in cooperation with the U. S. D. A. Soil Conservation Service and Bureau of Plant Industry, a total of 775 pastures in 9 important pasture areas, comprising parts of 20 counties, were examined as to kind and amount of vegetation, soil type, depth of surface soil, amount of erosion, and degree of slope. Determinations were made of available phosphorus and soil acidity, and data were obtained on pasture management and carrying capacity. Standards for approximate evaluation of pastures based on percentage of desirable species were developed. See also previous notes (E. S. R., 77, p. 776, 777).

An average of 5.3 acres of nonwoodland pasture was required to pasture one animal unit in the poorest area, whereas in the best area an average of 2.5 acres sufficed. The wide differences in carrying capacity among different areas and among individual pastures were found to be related closely to the type of vegetation present. In the area with lowest carrying capacity, less than 11 percent of the pasture sod was made up of desirable grasses and legumes, compared with 47 percent in the best area. Soil acidity and lack of available phosphorus were the most important factors responsible for poor type of vegetation. Of the total area studied, 85 percent needed lime and 94 percent was deficient in available phosphorus. Soil type, degree of slope, and soil erosion were associated with these factors in affecting the type of vegetation. The principal soil series, ranked in increasing order as to percentage of desirable species in the pastures, are Meigs, Dekalb, Upshur, Westmoreland, Pope, Frankstown, Hagerstown, and Huntington. Estimates on the basis of various soil factors, particularly slope and erosion, were that 25 percent of the pasture area studied could not be improved economically but should be returned to woods.

Improvement practices are recommended.

[Potato production in Iowa] (*Iowa State Hort. Soc. Rpt., 70 (1935), pp. 271–274, 277–283, 308–313, 316, 317, 319–323, figs. 6*).—Papers bearing on potato research and improvement include The Seed Potato Protection Act (pp. 271–273), The Canadian Marketing Act (pp. 308–310), The British Potato Marketing

Board (pp. 310–313), Interlacing Potato Leaves as Protection Against Frost on Muck Lands—Other Factors Tending to Prevent Frost Damage (pp. 319–322), and Sprays, Fertilizers, and Seed for Potatoes, 1935—A Recipe for Prosperity (pp. 322–323), all by C. L. Fitch, The Curing and Storage of Sweet Potatoes, by N. D. Morgan (pp. 273, 274), and New Varieties of Potatoes for the Corn Belt, by A. T. Erwin (pp. 277–283) (all Iowa); and Progress in Breeding Potatoes Suitable for Peat Land, by F. A. Krantz (pp. 316, 317) (Minn.).

[Potato research in Ohio] (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 52–60, 67–69, 75, 76*).—Results obtained by the Ohio Experiment Station are reported in papers entitled Early Potato Trials and Late Crop Seed, by W. E. Weaver (pp. 52–57); The Effect of Varying the Copper-Lime Ratio in Bordeaux Mixture on Potato Yields, by P. E. Tilford (pp. 57–60); and Fertilizers in the Subsoil for Potatoes (pp. 67–69) and Rotations for Potatoes (pp. 75, 76), both by J. Bushnell.

Potato breeding investigations in 1936: Review of literature, C. F. Clark (*Amer. Potato Jour., 14 (1937), No. 8, pp. 253–258*).—The review covers different phases of potato improvement research, listing 21 titles.

Developments in potato fertilizer investigations in 1936, O. Smith (*Amer. Potato Jour., 14 (1937), No. 8, pp. 245–253*).—Covering reports on nutrition, fertilizer, and soil fertility studies in direct application to potato production, this review, a contribution from Cornell University, embraces 53 titles.

The effect of certain methods of potato cultivation on growth and yield and accompanying soil conditions, G. C. Moore (*Amer. Potato Jour., 14 (1937), No. 6, pp. 175–184, figs. 3*).—Largely noted from another source (E. S. R., 77, p. 185).

Sorghums varietal tests in Utah, R. W. Woodward, D. C. Tingey, and R. J. Evans (*Utah Sta. Bul. 281 (1937), pp. 8, fig. 1*).—Varietal trials with grain sorghum and sorgo were carried on, 1931–36, at the station and on outlying fields in several counties, in cooperation with the U. S. D. A. Bureau of Plant Industry. Sooner milo, Red Amber and Dakota Amber sorgo, Dwarf hegari, and Kalo were found dependable at the station, where the better sorghums compared favorably with standard corn varieties in total green silage. Sorghums must compete either with barley or oats for grain or with corn for silage, which limits their importance as a crop for Utah. Except in limited areas were corn is not grown successfully, as the St. George area and parts of Millard County, sorghums can hardly be recommended to replace small grain for seed or to replace corn for either silage or grain production.

Sweet clover studies on habit of growth, seed pigmentation, and permeability of the seed coat, T. M. Stevenson (*Sci. Agr., 17 (1937), No. 10, pp. 627–653, pls. 2, figs. 2; Fr. abs., pp. 653, 654*).—In inheritance studies of the mottled condition of the seed coat in *Melilotus alba*, made in F_2 and F_3 of certain crosses, mottling was found to be dominant when other factors favor the development of pigment and to be determined by a single factor pair. Plants potentially mottled may or may not develop pigment in their seed coats and seeds with clear and with pigmented coats often appear on the same plant. Progeny plants in the above study could not be crossed accurately on appearance of seed coats. The pigment involved in this mottling has the general properties of anthocyanins and is located in the lower parts of the Malpighian cells.

Behavior in crosses between dwarf branching and common biennial white sweetclover showed the dwarf branching growth to be recessive and to depend

upon a single factor difference. Most of the dwarf branching type plants are readily recognized as seedlings, but a few did not develop typical branching from the crown until later. Mottled and clear seeds and type of growth were not associated in inheritance.

Examination of seeds from 10,982 plants of common white sweetclover, grown in 1931, showed that 99.3 percent could not germinate due to impermeability of the seed coats. Plant selections producing relatively high percentages of naturally permeable seeds were obtained from the Arctic variety. Selection for two generations within inbred lines of plants producing the highest proportions of naturally permeable seeds resulted in marked increases in proportions of permeable seeds and of plants producing permeable seeds. Continuous selection of plants producing only hard seeds resulted in a marked increase in the proportion of hard seeds in the second generation inbred lines.

Permeable areas were distributed at random and not confined to any particular region of the seed coat. The light line was shown to be the real region of impermeability in hard seeds. Apparently sulfuric acid treatment rendered hard seeds from highly permeable lines permeable, but only a small proportion of hard seeds from impermeable lines. A high proportion of seeds from permeable plants not germinating readily in laboratory tests germinated without treatment in moist soil. Seeds having brownish spots (wherein the cells of the coat were somewhat disorganized) appeared in some plants in highly permeable lines, and such discolored areas absorbed osmic acid solution readily. However, naturally permeable seed in those lines were not limited to those with brownish areas.

Variability in carotenoid pigment content of individual plants of Triticum vulgare and Triticum durum, M. C. Markley (*Cereal Chem., 14 (1937), No. 3, pp. 400–409, figs. 6*).—The total carotenoid content of individual wheat plants was correlated negatively with kernel weight when calculated at the Minnesota Experiment Station as parts per million of the ground wheat meal and positively when calculated as weight of pigment per kernel. Variability in kernel weight was correlated positively with the correlation between kernel weight and weight of carotenoids per kernel. Examination of the carotenoid content of individual F_2 plants from crosses between durum wheat varieties differing in this character did not reveal Mendelian ratios. Multiple factor inheritance of carotenoid pigments was found in durum wheats. Highly pigmented plants were found in the F_2 of crosses between highly pigmented Mindum durum and less highly pigmented Mindum × Pentad lines. Correction factors for carotenoid pigments and for variation in kernel weight were developed.

Spring wheat production and varieties for Wyoming, G. Hartman (*Wyoming Sta. Bul. 224 (1937), pp. 36, figs. 11*).—Practical information in growing wheat on dry land and under irrigation, derived from experiments and experience, are presented, and important varieties are described. Winter wheats yielded more per acre under dry-land conditions than did spring wheats, while the reverse was true under irrigation. Fall plowing for spring wheat evidently should be practiced on irrigated lands in order to permit early seeding. If spring wheat follows a cultivated crop, disking and floating may suffice. It is emphasized that wheat should be planted early to take advantage of early spring moisture.

Marquis hard red spring wheat, averaging 41.96 bu. per acre, gave the highest yield, 1920–36, followed by Baart semihard white wheat with 41.81 bu., and Kubanka spring durum 41.67 bu. The newer hybrid wheat, Hope, promised to outyield Marquis slightly.

Soft winter wheat studies.—V, Evaluating the quality and the strength of some varieties, E. G. Bayfield and V. Shiple (*Cereal Chem., 14 (1937), No. 4, pp. 551–577*).—A 8-yr. study of various measures of flour characteristics, made cooperatively by the Ohio Experiment Station, is reported in the fifth of this series (E. S. R., 74, p. 484). The relationship between certain measurements was determined statistically.

The outstanding importance of protein content upon the strength of soft wheat flour was shown clearly. The amount of protein, determined by ordinary Kjeldahl methods, probably is the most important single test which is both accurate and rapid. With sound wheat of approved varieties, the protein determination gives valuable information and is a good measure of probable flour strength, but takes no account of differences in protein quality existing between varieties and affecting strength of flour. Significant differences in protein quality within one variety were in evidence when a variety was grown under several environmental conditions.

Viscosity measurements made upon samples containing a uniform quantity of protein proved promising as a possible measure of protein quality but not entirely conclusive. Of the three measures of strength, loaf volume and viscosity based on 20 g of flour proved more accurate and sensitive than time as determined upon wheat meal. Tests of several baking formulas indicated that the use of bromate is desirable in experimentally milled, unbleached samples. Use of malt and phosphate in conjunction with bromate appeared promising for baking soft winter wheat flours.

Chemical weed killers, I, II, W. H. Cook (*Canad. Jour. Res., 15 (1937), No. 7, Sect. C, pp. 299–323, fig. 1; No. 8, Sect. C, pp. 380–390, figs. 3*).—Two papers are presented.

I. *Relative toxicity of various chemicals to four annual weeds.*—Toxicity tests made at the University of Alberta on *Thlaspi arvense, Brassica arvensis, Chenopodium album,* and *Avena fatua* showed no definite evidence of a specific susceptibility of a given species to a given substance. The relative resistance of these four weeds to most substances, judging from the certainly lethal dose, was in the order 1:1:2:7. Of 76 chemicals tested, the following most toxic compounds killed all four species at the dosages employed: Selenic and chloric acids, sodium hydroxide, arsenic pentoxide, sodium arsenite, sodium and ammonium chlorate, ammonium thiocyanate, sodium cyanide, zinc chloride, sodium bichromate, sodium selenite, copper nitrate, sodium sulfide, formic acid, gasoline, phenol, creosote, tetralin, sodium benzoate, aniline, benzene, and furfural. The residual toxic effect on the soil, from 3 to 4 weeks after treatment, showed that of the 35 more toxic chemicals tested, only selenic acid and the 5 chlorates used had any appreciable effect at low and intermediate dosages, while 11 other substances depressed growth following application of high dosages.

II. *Factors affecting estimation of toxicity of leaf sprays.*—Chemicals applied to annual weeds gave frequently dosage-mortality curves not of the usual sigmoid shape. These departures appeared to be attributable to method of application, as the spray is only partly retained by the leaves and stems. Since the proportion of the applied quantity of poisonous constituent retained by the plant decreases as the volume of spray is increased, and increases with the concentration of the spray solution, leaf sprays will be most effective if the minimum volume of solution needed for coverage is used and the effective dosage of chemical obtained by adjusting concentration. Comparison of a few indices sometimes used for estimating efficacy of herbicides with the mortality criterion showed the number of leaves left and the height of the living plants after treatment to be of slight value for estimating effects of the chemical.

The weight per unit area of living plants remaining after treatment may be of some value.

Sodium ethyl xanthate as a plant poison, R. B. Harvey, J. Zalar, and R. H. Landon (*Science, 84 (1936), No. 2181, p. 356*).—A cooperative study by the University of Minnesota and the U. S. D. A. Bureau of Plant Industry showed that sodium ethyl xanthate has a pronounced toxicity for aerial parts of herbaceous plants but has no appreciable corrosive effect on spray equipment.

HORTICULTURE

[Horticultural research in the Southern States] (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 124, 126, 127, 129, 130, 265, 266, 271, 273–277*).—The following papers were presented at the convention of the Association of Southern Agricultural Workers at Jackson, Miss., Feb. 5–7, 1936: Growing Asparagus in the Far South, by W. D. Kimbrough (p. 124); Results of 1935 Tomato Variety Trials at the Georgia Experiment Station, by H. L. Cochran (p. 126); The Effect of Rate and Placement of Fertilizers on the Growth of Snapbeans, by J. C. Miller and R. E. Wright (pp. 126, 127); Relation of Fertilizer Treatment to Thickness of Fruit Wall in the Perfection Pimiento Pepper, by H. L. Cochran (p. 127); and Response of Early Truck Crops to Summer Legumes, by L. M. Ware (pp. 129, 130).

At the convention held at Nashville, Tenn., Feb. 3–5, 1937, the following papers were presented: Some Recommendations for the Development of the Horticultural Section, by W. D. Kimbrough (pp. 265, 266); Some Tree and Fruit Growth Responses of the Peach as Influenced by Soil Moisture Conditions, by I. D. Jones (p. 271); The Effect of Pruning on the Color of Elberta Peaches in the Yazoo-Mississippi Delta, by E. A. Currey (p. 273); A Progress Report of Tomato Variety Trial Work at the Georgia Experiment Station, by H. L. Cochran (pp. 273, 274); Factors To Be Considered in Growing American Grapes, by J. R. Cooper (p. 274); Grape Varieties for Florida, by R. D. Dickey (p. 274); Notes on Pruning Tomatoes, by V. M. Watts (p. 275); Physiological Studies of the Bush Lima Bean, by F. S. Andrews (pp. 275, 276); Pecan Variety Response to Fertilizers, by G. H. Blackmon (p. 276); and The Influence of Additional Illumination and Shading on the Earliness of China-Asters, by E. W. McElwee (pp. 276, 277).

[Horticultural studies by the Montana Station] (*Montana Sta. Rpt. 1936, pp. 28–30, 31, 38, 39, 44*).—Included are progress reports on the influence of nitrogen and phosphorus on apple trees; response of transplanted vegetables to fertilizer supplements such as dextrose and potassium permanganate; cover crop practices for the Bitterroot Valley orchards; and shelterbelt species for northern Montana.

[Horticultural investigations conducted by the Puerto Rico College Station], J. S. Simons, F. Méndez, J. Guiscafré Arrillaga, and L. A. Serrano (*Puerto Rico Col. Sta. Rpt. 1936, pp. 89, 91–107, 119, 120, 122, 123, 124–135*).—Brief discussions are presented on the culture of dwarf coconuts; propagation of citrus, mangoes, avocados, and miscellaneous fruits; fertilizers, shade species, light requirements, and pruning of the coffee plant, and testing of coffee varieties; production of sweet corn, testing of varieties of tomatoes, cucumbers, garlic, and carrots; fertilizers for peppers; development of cucumbers resistant to downy mildew and of eggplant resistant to bacterial wilt; control of onion thrips by varying dates of planting; production of tung oil, derris root, and Meyer lemons; and the culture of grapefruit.

Effects of variation in the soil water content on the growth of certain species of plants, W. W. Wiggin (*Ohio Sta. Bimo. Bul. 188 (1937), pp. 136–141,*

fig. 1).—Using auto-irrigator pots which made possible the control of soil moisture within narrow limits of variation for prolonged periods and also the accurate recording of the amount of water used by the plants, the author found that usually those plants receiving the greatest amount of moisture short of the saturation point made the best growth. In all plants used—calendula, cineraria, carnation, cyclamen, Melior and Lorraine begonias, chrysanthemums, poinsettias, snapdragons, Boston fern, stocks, and coleus—the greatest growth as fresh weight in grams was made under moist conditions, with the various species differing markedly in their response to moisture. Plants with deficient moisture throughout their development bloomed later than those under favorable conditions. Under equal moisture conditions a mulch of peat moss or the incorporation of peat moss into the soil caused decreased growth. Incorporation of organic matter increased the water-holding capacity and the moisture-supplying power of the soil. In the case of stocks, the greater the soil water content, the smaller the shoot-root ratio. The results were different with tomatoes and beans, suggesting that, perhaps with the stocks soil aeration requirements were higher than with the vegetables.

Early spring budding by the plate method, W. L. KERR (*Sci. Agr., 17 (1937), No. 12, pp. 713–719, figs. 3*).—Marked success was attained at the Dominion Experiment Station, Morden, Manitoba, in the propagation of apples, plums, pears, and certain ornamentals, such as lilac and rose, with buds inserted in April and May by the so-called plate method.

Preliminary tests with softwood cuttings of trees and shrubs in Alberta, C. R. URE (*Sci. Agr., 17 (1937), No. 12, pp. 720–726, figs. 2; Fr. abs., p. 726*).—Tests conducted with a considerable number of species demonstrated that many Alberta-grown trees and shrubs may be propagated by means of greenwood cuttings. Of three media used, sand, peat, and a mixture of the two, sand proved most satisfactory. A temperature of from 60° to 70° F. proved most desirable for the greatest number of species. In general, cutting at the node or just below was most desirable, with climbers and creepers more or less indifferent. Approximately a dozen species which failed to root at all were tested with growth-promoting substances.

Fall season busy one for nurserymen, H. B. TUKEY (*Farm Res. [New York State Sta.], 4 (1937), No. 1, pp. 12, 13, figs. 2*).—This is a brief, general discussion of various problems in the digging and storing of nursery stock under investigation at the station.

Asparagus fertilizer experiment on Long Island, P. H. WESSELS and H. C. THOMPSON (*[New York] Cornell Sta. Bul. 678 (1937), pp. 16, figs. 7*).—On the basis of 9 years' records taken from 1926 to 1934 on replicated plats established in a 1924 planting of Mary Washington asparagus located on an almost level field of Sassafras silt loam of a relatively low state of fertility, the authors report that nitrogen produced a greater yield increase than did any other element. The plats receiving phosphorus and potassium alone produced less asparagus than the unfertilized areas. Nitrogen applied at the rate of 50 lb. per acre supplied half-and-half from nitrate of soda and sulfate of ammonia produced over the 9 yr. practically the same yield as did 100 lb. of nitrogen. In the first 4 yr., 100 lb. was more effective than 50 lb., but thereafter the reverse was true. It is believed that increased acidity may have brought about this reversal.

When applied with equal amounts of nitrogen and potassium, 128 lb. of phosphoric acid in superphosphate produced large increases over 64 lb. The authors believe that in the smaller applications the phosphorus was fixed in the soil. Potassium applied as chloride at the rate of 80 lb. of potassium oxide per

acre per year gave, when used with equal amounts of nitrogen and phosphorus, marked increases in yield over no potassium. Potassium chloride was superior to sulfate of potassium, probably because of its chlorine content. Manure at a cost of more than $4 per ton was not profitable, despite the fact that 20 tons plus 120 lb. of phosphoric acid per acre produced the highest yield of all treatments.

The various treatments had little effect on the proportion of spears that attained marketable size. There was a general tendency for the number and total weight of spears to increase and the average weight to decrease as the experiment progressed.

Some investigations with regard to the effect of nitrogen on the storage qualities of celery, L. Bourque (*Sci. Agr., 17 (1937), No. 12, p. 741*).—In studies conducted by the Macdonald College, Province of Quebec, Canada, it was observed that with phosphorus and potash held constant at 8 and 10 percent, respectively, increasing the percentage of nitrogen from 0 to 14 percent did not influence the yield of celery growing on muck soils. Celery from the various nitrogen plats showed similar physical storage qualities, such as pithiness, break-down of leaves and petioles, etc. No effect of nitrogen was observed in the total nitrogen of the plants from the various plats. Hexose sugars increased gradually until the end of the storage period, while sucrose showed a slight decline. The economical duration of storage was from 90 to 100 days under the conditions of the investigation.

The production of ginger root in Puerto Rico [trans. title], L. A. A. García and R. A. Vizcarrondo (*Rev. Agr. Puerto Rico, 28 (1937), No. 4, pp. 726–740, figs. 2*).—In this general discussion of culture, harvesting, and preparation of the marketable product, the authors present data on the comparative composition of Puerto Rico and Jamaica grown ginger and on the cost of production.

Sweet corn trials in Ohio, 1935–1936, J. B. Park (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 24–29*).—Based on carefully planned and replicated trials, the Ohio Experiment Station suggests Gemcross 39, Spancross 2, and Marcross 39 for early crops, Whipcross C 6.2 and Spancross P 39 for second early, and Golden Cross Bantam for midseason. Growers are warned that only the first generation seed of crosses produces yield and uniformity characteristic of hybrids.

The effect of spacing fall tomatoes on the yield, size, and grade of fruit, I. C. Hoffman (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 85–87*).—Tomato plants so spaced in the greenhouse as to allow 4.5 sq. ft. per plant not only produced greater total yields per equal areas than comparable plants spaced 3.75 sq. ft. per plant, but also were grown at a considerable reduction in cost for labor, etc.

The effect of raising tomato plants with supplementary electric light on earliness and grade of greenhouse tomatoes, I. C. Hoffman (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 92–94, fig. 1*).—The exposure of young potted tomato plants designed for the spring crop to supplemental light during the hours from 5 a. m. to 7 p. m., except when the sun shone brightly, resulted in more rapid growth and a darker green color. When transplanted to the greenhouse beds, the light-treated plants reached full bloom from 7 to 10 days earlier than the unlighted, the fruit began to ripen fully a week earlier, and a higher percentage of the fruits were of the first grade.

Studies in the growth and respiration of tomato fruits and their relationship to carbohydrate content, N. C. W. Beadle (*Austral. Jour. Expt. Biol. and Med. Sci., 15 (1937), No. 3, pp. 173–189, figs. 8*).—Using the Kondine tomato, a variety with 20 or more fruits per cluster, there was observed in this study

the fact that the position of the fruit on the plant determines not only its size but also its carbohydrate content, respiratory intensity, and growth rate. The climacteric rise occurs and is coincident with the appearance of color in the fruit. In any cluster, the flower nearest the main stem was fertilized first, and the resulting fruit apparently monopolized the food materials so that it grew at a more rapid rate and had a higher respiratory rate than its associates. However, slight increases in size were noted even in the most remote fruits. Premature picking did not prevent the occurrence of the climacteric rise, but the maximum value attained was reduced. The curve for the percentage of reducing sugars during ripening was followed closely by the climacteric curve, but the maximum was reached slightly before that of the climacteric rise.

Tomato seed treatment and plant certification, R. W. SAMSON (*Canner, 84 (1937), No. 12, II, p. 121*).—Experiments at the Indiana Experiment Station indicate that certain organic mercury compounds, such as ethyl mercury tartrate, effectively disinfect the seed surfaces and protect the seed from reinfection for a considerable period. Seeds treated with a 1 : 32,000 solution germinated better in the greenhouse and field than did those with 1 : 3,000 mercuric chloride. The fact that the tomatoes grown for seed purposes are usually taken from well-grown, carefully rogued fields favors a minimum of disease.

Apple breeding investigations.—I, Results obtained from certain families of seedlings, G. T. SPINKS (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1936, pp. 19–49*).—Studies of inheritance in approximately 1,300 apple seedlings representing 69 crosses, of which 45 were controlled and 24 open-pollinated showed no sharply discontinuous segregation of any specific characters. Parents with the most sharply distinct characteristics produced the largest proportion of seedlings showing similar characters. It is suggested that crosses between like parents are more apt to produce a much larger proportion of seedlings in which a desired character is present or even itensified than would combinations of unlike parents. For example, crosses between dessert and culinary apples resulted in a large proportion of seedlings of indefinite classification with respect to these two characteristics. Most of the characters commonly considered in the apple are influenced by polymeric factors.

Investigations on the variability of apple trees on seedling and on clone root-stocks.—Progress report, I, G. T. SPINKS (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1936, pp. 50–65*).—Measurements of apple varieties worked on clonal stocks and on seedling stocks from several sources failed to show, up to 5 yr. of age in the nursery, any significant differences in variability due to type of rootstock. Grading of seedling and clonal stocks prior to planting in the nursery did not result in greater uniformity of the trees. Within 6 yr. after transplanting from the nursery no difference in variability was noted for any given variety between trees on clonal and single variety seedling stock. However, variability was greater in the mixed seedling stocks, as a whole, where the trees were transplanted from the nursery without selection.

Top-working Grimes on Virginia Crab, C. L. BURKHOLDER (*Ind. Hort. Soc. Trans., 1936, pp. 111–113*).—Top-worked Grimes Golden trees developed by grafting scions at about 20 in. above ground on five different stocks, French seedling, Delicious, Walbridge, Arkansas Black, and Northwestern Greening, all suffered severe losses from disease and winter killing. Attention is called, however, to certain mature and thrifty Grimes Golden orchards in Iowa where the trees were top-worked successfully on limbs of Virginia Crab and Haas.

Recent developments in control of graft knots on nursery apple trees, A. J. RIKER (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 956–960, figs. 5*).—Stating

that graft knots caused by three different conditions, (1) excessive callus, (2) hairy root infection, and (3) crown gall, have resulted in considerable losses to nurserymen, the author discusses experimental activities whereby commercial control has been made possible under Middle West environments. Involved in control are (1) the preparation of well-fitted grafts from clean roots with dry surfaces, (2) the dipping of roots in corrosive sublimate, (3) the wrapping of piece root grafts with a special kind of adhesive tape to prevent the entrance of root-chewing insects, and (4) the selection of soil relatively free from insects.

Making the Delicious apple bear profitable crops, M. A. Blake (*Md. State Hort. Soc. Proc., 39 (1937), pp. 81–86*).—Presenting data to show that the Delicious apple is normally a comparatively light producer in New Jersey, the author presents certain standards of measurement for Delicious apple spur leaves which may be used as an indication of the condition of the trees with respect to fruiting capacity. The failure of the Delicious to come into bearing normally may be due to various causes such as a too heavy soil, too much or unbalanced fertility, and a deficiency of calcium in the soil.

Detail pruning to assist in the production of better apples, A. L. Schrader (*Md. State Hort. Soc. Proc., 39 (1937), pp. 20–22*).—In this general paper the author presents certain data obtained by the Maryland Experiment Station on the effects of different intensities of pruning on the size of fruit and yield of York Imperial apple trees. Total yields over a period of years were only slightly influenced by the degree of pruning, but heavy pruning increased the size of individual apples to the extent of interfering with their salability.

The results of breeding pears for half a century, G. H. Howe (*Farm Res. [New York State Sta.], 4 (1937), No. 1, pp. 3, 4*).—Summarizing briefly the pear breeding activities of the station, the author describes some of the more promising varieties and seedlings, with comments as to their potential usefulness.

Winter injury and drouth damage to stone fruits: Recommended varieties, L. Havis (*Ohio State Hort. Soc. Proc., 70 (1937), pp. 24–31*).—Following the severe winter of 1935–36, observations were made on the response to low temperature of varieties of peaches, plums, and cherries, and as a result definite recommendations are made for planting in different parts of the State. The various factors, such as soil type, cultural treatment, age of the tree, pruning, and insect or disease injury as related to winter injury, are discussed.

Finds New Jersey peaches promising, R. Wellington (*Farm Res. [New York State Sta.], 4 (1937), No. 1, pp. 1, 9*).—Based on a visit to the New Jersey Experiment Stations, the author discusses some of the more promising varieties and seedlings of peaches developed by those stations, particularly with reference to their probable value to New York growers.

Pollination of the Shiro plum, G. H. Dickson (*Sci. Agr., 17 (1937), No. 12, pp. 727–729; Fr. abs., p. 729*).—Noting the failure in the orchard for Burbank pollen to fertilize Shiro blooms, hand pollinations were made on the limbs of a completely enclosed Shiro tree with the strange result of a fine set from Burbank pollen, with Red June also giving good results. Fair sets of fruit were obtained with domestica pollens, but the seeds were almost completely sterile. The reason for the peculiar behavior of Burbank pollen is not completely understood.

1934 and 1935 plum and prune variety yields at the Purdue Farm test plot, Bedford, Indiana, C. L. Burkholder (*Ind. Hort. Soc. Trans., 1936, pp. 94–96*).—Tabulated yields are presented on 15 varieties of European plums.

Good crops were secured with most varieties in 1935, despite a minimum of 27° F. during full bloom.

Factors influencing the ripening season of sour cherries, V. R. GARDNER (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 7, pp. 521–532, fig. 1*).—Stating that in certain seasons the picking period for the Montmorency cherry may extend over a period of approximately 2 mo., the author discusses, on the basis of individual tree records in several orchards, certain factors that influence maturation. Seasonal influence was important, with the ripening season varying as much as from 2 to 3 weeks from year to year in the same tree. Low temperatures during the growing season greatly retarded and high temperatures accelerated ripening. There was noted a marked tendency for trees bearing relatively light crops to mature their fruits early and evenly and for trees bearing heavy crops to mature the fruits late and rather unevenly. Trees with moderate crops were intermediate in both time and uniformity of ripening. Apparently with large crops the amount of leaf surface per fruit was a limiting factor. This was further shown by the fact that heavy applications of nitrogen promoted vigorous vegetative growth and, at the same time, even maturity. Contrary to general opinion, the fruit of the heavily fertilized trees matured early. Other cultural methods, such as spraying to protect the leaves and the pruning out of small interior limbs as an aid to the development of abundant foliage, promoted evenness and earliness.

Bud sports differing from the regular Montmorency in season of ripening are said to be of rather frequent occurrence in the sour cherry, but are conceded of secondary importance to cultural and seasonal factors in causing delayed or uneven ripening in the crop as a whole.

Seed germination of the Saskatoon and Pincherry, P. D. HARGRAVE (*Sci. Agr.*, *17* (*1937*), *No. 12, pp. 736–739; Fr. abs., p. 739*).—Seeds of *Amelanchier alnifolia* and *Prunus pennsylvania* were found, after a period of adequate afterripening, to germinate at temperatures of 1.5° C. (34.7° F.). Storage at room temperature shortened the rest period of the *P. pennsylvanica*. The *Amelanchier* seeds required 200 days of afterripening at from 1.5° to 3° before germinating.

The cultivated cranberry in Washington, D. J. CROWLEY (*Washington Sta. Bul. 349* (*1937*), *pp. 46, figs. 10*).—This is a general statement presenting information on such factors as the selection of site, preparation of bogs for planting, varieties, weed control, prevention of frost injury, control of insect pests and diseases, harvesting, etc.

Comparative yields of blackcurrant varieties and their response to differential pruning treatment, T. SWARBRICK and W. E. BERRY (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1936, pp. 66–74*).—A comparison of heavy and light pruning of the varieties Baldwin, Boskoop, Edine, and French showed a significant reduction in yield in every case following heavy pruning.

American grape varieties, I. W. DIX and J. R. MAGNESS (U. S. Dept. Agr. *Circ. 437* (*1937*), *pp. 34, figs. 4*).—Based largely on the results of tests conducted over a period of years at Arlington Farm, Va., tabulated descriptive data are presented on 221 varieties of grapes, mostly of Labrusca and part-Labrusca parentage. In addition, the authors sketch briefly the history of the development of American grape varieties and discuss some of their most important characteristics.

Pollination and the setting of fruit in the Black Corinth grape, H. P. OLMO (*Amer. Soc. Hort. Sci. Proc.*, *33* (*1936*), *pp. 402–404*).—Studies by the California Experiment Station indicated that girdling, as well as pollination, is essential to the production of a satisfactory crop despite the fact that no

seeds were formed. Abundant pollen was produced and many grains were deposited on the stigmas. Some berries develop occasionally without pollination, but such vegetative parthenocarpy was rare and even with girdling cannot be relied upon for a satisfactory set of fruit. Partial seed development may occur apogamically, but no endosperm or embryo development was detectable in such seed.

The deterioration of grape-vines in saline soils, S. RAVIKOVITCH and N. BIDNER (*Empire Jour. Expt. Agr., 5 (1937), No. 19, pp. 197–203, pls. 2, fig. 1*).—Injury to Chasselas and Muscat Hamburg vines growing under irrigation in Palestine was found due to high concentrations in the soil of chlorine as sodium chloride. Analyses of fruit from healthy and affected vines showed considerable differences in the content and composition of soluble salts. The percentage of sodium chloride ranged from 0.15 percent in healthy Muscat to 2.47 percent in badly affected Chasselas fruits. The amount of glucose diminished and that of acids increased with progressive stages of deterioration.

A study of citrus varieties, A. F. CAMP and J. H. JEFFERIES (*Citrus Indus., 18 (1937), No. 1, pp. 5–7, 20, 21, figs. 4*).—A comparison of the Marsh Seedless grapefruit with three seed-producing strains, all on rough lemon roots and all planted in the winter of 1924–25, showed in 1936 that the Marsh trees had the largest trunk girth and were largest with respect to height and spread. In 7 yr. of production the Marsh trees out-yielded greatly the other three strains. Following the severe December 1934 freeze, Marsh Seedless held considerable of its crop, while the seedy varieties dropped all of their fruits.

A comparison of rough lemon and sour orange as citrus rootstocks on light sandy soils, A. F. CAMP and J. H. JEFFERIES (*Citrus Indus., 18 (1937), No. 2, pp. 3, 18*).—Observations by the Florida Experiment Station in a variety orchard consisting of oranges, tangerines, and grapefruits established at the Citrus Experiment Station in 1922 showed that the trees in all three species on rough lemon rootstocks were much more productive than on sour oranges. However, following the severe freeze of December 1934 the trees on the rough lemon suffered much more injury. The fruits produced by the trees on the sour orange were also of better quality as to flavor and texture, but this advantage was greatly offset by the much higher productivity of the rough lemon crops.

Important considerations in selection of lemon scion varieties, F. F. HALMA (*Calif. Citrogr., 22 (1937), No. 11, pp. 493, 506, figs. 8*).—Evidence is presented in the form of photographs of progeny trees to show that differences in tree condition may be due to inherent differences in the scion strain or variety, rather than to rootstock influences. Own-rooted trees were found to offer an excellent means of comparing scions because the understock influence was eliminated. The author feels that the type of lemon tree decline so widespread in California in recent years has its primary cause in the propagation of scions of inherently low vigor but of early and heavy fruiting habits. The almost universal habit of dwarfing sour orange stock has accentuated the difficulty.

The influence of different pollens on the development of the pistache nut, R. H. PEEBLES and C. HOPE (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 29–32*).—In this study conducted at Sacaton, Ariz., by the U. S. Department of Agriculture, time of ripening and, to a lesser extent, dehiscence and length of pericarp were found to be influenced by the variety of pollen applied to *Pistacia vera* flowers. Pollinated on March 29 with pollen of *P. atlantica*, *P. chinensis*, and an unknown hybrid, the following percentages of maturity were recorded, respectively, on August 28 for the Trabonella variety: 53.1±6.6,

9.9±2.9, and 80.8±2.5. It was evident that *P. atlantica* pollen increased the percentage of self-splitting nuts in the Trabonella variety. The mean length of the entire fruit but not of the hulled nut was slightly but significantly increased by the use of the pollen of the unknown hybrid.

Propagation of Daphne cneorum by cuttings: Effect of growth substances, J. A. DeFrance (*Florists Exch. and Hort. Trade World, 88 (1937), No. 12, p. 20B*).—In experiments conducted by the Rhode Island State College in which cuttings were treated with indoleacetic acid solution and a commercial product, the results were sufficiently favorable to lead to the conclusion that the use of growth-promoting substances stimulates and hastens rooting in this species and should have practical value for plant propagators. Of the various rooting media used, the best results were secured with sand, a mixture of sand and cinders (half-and-half) and a mixture of peat and cinders (1 and 7 parts).

Some factors in delphinium seed germination, J. S. Shoemaker (*Sci. Agr., 17 (1937), No. 12, pp. 730–732; Fr. abs., p. 732*).—Comparative studies with delphinium seeds produced locally in Alberta, Canada, with those produced in England and the United States showed considerably higher germination for the local seed. Separation of any given lot into large and small seeds did not result in differences in time required to germinate, but did produce differences in total germination greatly in favor of the larger seeds.

Corm behaviour in the gladiolus in relation to season of bloom, R. M. Adamson (*Sci. Agr., 17 (1937), No. 12, pp. 733–735*).—At the University of Alberta, it was found that early varieties require, on the average, about 10 days longer, and late varieties about 20 days longer to reach bloom than do the same varieties in Ontario. On the basis of time differences, there is proposed a varietal classification for gladiolus under Alberta conditions. Measurements of corms formed by varieties in the several seasonal classes showed, after 2 years' growth, considerable gain in the early groups and an actual loss of 13 percent or more in the latest group.

Factors affecting Easter lily flower production in Florida, W. B. Shippy (*Florida Sta. Bul. 312 (1937), pp. 19, fig. 1*).—Attention is called to three important factors which interfere with the commercial production of Easter lilies in Florida—(1) failure to properly combat diseases and insects, (2) improper care of the bulbs during the rest period, and (3) failure of the lilies to bloom by Easter.

In 1932 bulbs dug August 1 were subjected to warm storage for 13 and 57 days, and cool storage for 21, 34, 51, and 65 days. It was evident that neither of the warm-storage treatments nor the 21-day cool-storage treatment had any significant effect on hastening the time of plant emergence or the time of flowering. Thirty-four days or more of cool storage caused many bulbs to sprout early and hastened plant emergence by about 1 mo. The cool-storage-treated bulbs made rapid growth and the plants produced many flowers in advance of the usual time, but cool storage also caused the plants to produce a substantial number of blossoms after the usual season.

Studies in 1933 with bulbs dug July 6 and later and subjected to different storage treatments again showed that no warm-temperature treatment, whether in the soil or in storage, had any effect on hastening growth processes. A brief period of 15 days of cool storage proved insufficient to hasten plant emergence, regardless of when applied. A substantial number of early flowers resulted from 30-day cold treatments when applied after the middle of August. In agreement with 1932 results, the proportion of early flowers increased as the cool-storage period extended later into the fall. Since bulbs may start

forming new roots by late August or early September, the author advises placing them in cool storage on or about August 15 and holding them for 45 days.

In 1933 bulbs held in warm storage produced one-third more flowers than those given cool treatment. However, the warm treatments did not influence bulb increase, and, in fact, where comparisons were possible between 30 days of warm storage and 30 days of cool storage, the cool plats produced 66 percent more bulbs.

A physiological study of dormancy in seed of Magnolia acuminata, M. Afanasiev (*[New York] Cornell Sta. Mem. 208 (1937), pp. 37, figs. 11*).—Discussing the anatomical structure of the seed and the normal reproductive habits of the species, the author reports that delayed germination is caused by dormancy of the embryo. A number of forcing agents, such as thiourea, copper sulfate, dextrose, hydrogen peroxide, and ethylene chlorohydrin, failed to induce germination in the dormant seed, which required afterripening in moist storage at temperatures ranging from 0° to 23° C. (32° to 73.4° F.). Afterripening was hastened by removal of the pulp and seed coat and placing the naked embryo for about 2 weeks on a moist medium at a temperature of between 32° and 41° F. The maximum total germination of seed was secured when the temperature was alternated between 59° and 78.8°. Partly afterripened seeds reverted to a secondary dormancy when kept too long in storage under conditions unfavorable to germination. Under conditions favorable to germination a green pigment (not chlorophyll) was produced wherever viable kernels were exposed by mechanical injury. Catalase activity decreased slowly during the first phase of afterripening in moist storage at 32°, but increased sharply as soon as the seeds were placed under favorable germinative conditions. A fair degree of correlation was noted between catalase ratio and viability, but was useful only in revealing nonviable seeds or those of very low viability.

Answers to unusual rose questions: Influence of heeling-in, mulches, fertilizers, and sprays and dusts on roses, H. R. Rosen (*Amer. Rose Ann., 1937, pp. 108–119*).—Studies conducted by the Arkansas Experiment Station indicated that late autumn purchase of rose plants, followed by heeling-in over winter, may give better results than late-winter or early-spring accession. Contrary to expectations, there was some indication that winter mulching did more harm in the early spring of 1936 than good, possibly because the protection tended to stimulate early growth and render the plants more susceptible to belated freezes. With reference to summer mulches, there was no evidence in the very dry summer of 1936 that mulched plants of either Betty Uprichard or of Edith Nellie Perkins survived or bloomed better than did cultivated plants. So far as the fertilizing value of stable manure or of cottonseed-meal mixture was concerned, the author suggests that both might just as well be omitted, but points out that the drought may have interfered with the usefulness of fertilizers. In fungicide tests it was evident that any dust containing a high percentage of finely ground sulfur is unsafe during hot weather. Among varieties showing considerable resistance to drought were Ami Quinard, Betty Uprichard, Columbia, Eclipse, Edith Nellie Perkins, Golden Dawn, Margaret McGredy, Miss Rowena Thom, Mrs. Aaron Ward, Soeur Thérèse, and Talisman.

Rosa rugosa hybrids, N. E. Hansen (*Amer. Rose Ann., 1937, pp. 49–51*).—Stating that *R. rugosa* hybridizes freely with other species, the author reviews briefly the history of the development of the rugosa-type roses and enumerates as seedlings produced by the South Dakota Experiment Station Amdo, Kitana, Koza, Minisa, Okaga, Sioux Beauty, Tegala, Teton Beauty, Tetonkaha, Yanka, Yatkan, Zani, and Zika. Progress is also indicated in the development of thornless roses.

North American rock plants (First series), W. H. A. Preece (*New York: Macmillan Co., 1937, pp. XV+204, [figs. 100]*).—General information is presented on species and cultural requirements and utility in the rock garden.

FORESTRY

Forest planting on Illinois farms, J. E. Davis (*Illinois Sta. Circ. 477 (1937), pp. 38, figs. 22*).—This is a circular of general information as to the planning of forest plantations, desirable conifers and hardwoods, methods of seeding and transplanting, care of the plantation, and probable costs and returns.

Ohio Forest News, [October 1937] (*Ohio Forest News [Ohio Sta.], No. 32 (1937), pp. 12, pl. 1, figs. 7*).—This number is devoted to a historical account and description of the John Bryan Park, located in Greene County.

Human and physical resources of Tennessee.—VI, Forests and woodland, C. E. Allred, S. W. Atkins, and W. E. Hendrix (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 47 (1937), pp. VI+70–83, figs. 5*).—One of a series of monographs (E. S. R., 78, p. 162) dealing with the principal economic, social, and civil aspects of the State, this mimeographed report shows that commercial forests occupy 52 percent of the total land area of Tennessee. Of the 14,000,000 acres of commercial forests, 5,000,000 are in saw timber, 7,200,000 in cordwood, and 1,800,000 in restocking areas. A total of 170 species was recorded, with oaks constituting 47.7 percent of the saw timber and the hardwoods 88 percent. Annual drain is estimated as 1⅔ of the annual growth. As a source of farm income, forest products were exceeded in value only by cotton, tobacco, corn, and hay.

A study of natural tree reproduction in the beech-birch-maple-hemlock type, A. F. Hough (*Jour. Forestry, 35 (1937), No. 4, pp. 376–378*).—A 6-yr. record of the behavior of regeneration in a 60-year-old stand in Warren County, Pa., suggested methods of stand improvement applicable to the beech-birch-maple-hemlock types. In order to establish reproduction, it was found necessary to open up the crown cover by thinning or to make a light individual selective cutting prior to the final logging. Subsequent weedings to favor the better species must follow within the first 10 yr.

Applicability of the selection method in northern hardwoods, F. H. Eyre and J. R. Neetzel (*Jour. Forestry, 35 (1937), No. 4, pp. 353–358*).—Net growth increment following experimental selective cuttings in northern hardwoods in Marquette County, Mich., amounted to as much as 245 bd.-ft. per acre annually where one-third to two-thirds of the original stand was left as good growing trees. The need of leaving an adequate growing stock of thrifty trees was highly evident. Mortality was reduced by selective cuttings of the single-tree type and was greatest of all in the uncut forest. A single tree selection which permits the removal of defective and mature trees, regardless of spacing, gave the best results.

Tools and labor requirements for pruning longleaf pine, H. Bull (*Jour. Forestry, 35 (1937), No. 4, pp. 359–364*).—The author discusses the efficiency of various tools, methods, costs, and the results of pruning open-grown, second-growth saplings and small poles, and presents data for estimating pruning costs as balanced against probable increases in the values of sawlogs and other products as a result of increasing the proportion of clear material.

The relation between mycorrhizae and the growth and nutrient absorption of coniferous seedlings in nursery beds, H. L. Mitchell, R. F. Finn, and R. O. Rosendahl (*Black Rock Forest Papers, 1 (1937), No. 10, pp. 58–73,*

pls. 2, figs. 2).—Studies in an experimental nursery established in the Black Rock Forest with seed of white pine and red spruce showed few or no mycorhiza in beds supplied with sufficient fertilizer nutrients to preclude any possible mineral deficiency. The greatest mycorhizal development occurred in beds in which the soil was lacking in one or more nutrient elements. In infertile soil, infected seedlings absorbed significantly greater amounts of nitrogen, phosphorus, and potassium, and their dry weight increase was significantly greater than that of uninfected seedlings under the same conditions. Seedlings lacking mycorhiza are unable to exist in highly infertile substrates.

Use and function of peat in forest nurseries, S. A. Wilde and H. H. Hull (*Jour. Amer. Soc. Agron., 29* (*1937*), *No. 4, pp. 299–313, figs. 5*).—In studies by the Wisconsin Experiment Station it was observed that peats having a reaction of pH 5.5 or less were most desirable in forest nurseries, particularly those devoted to the production of conifers. Although peat ranging from pH 6.0 to 7.0 was satisfactory for hardwoods and transplants, the hazard from damping-off and other diseases at this reaction was too great in the case of conifer seedlings. Peats above 7.0 were dangerous because of plant disease and the direct toxicity of carbonates. With a total nitrogen content of 2 percent or more, peat is deemed a satisfactory source of nitrogen, but below 1 percent is of relatively little value. The base exchange capacity of 100 milliequivalents per 100 g is said to be satisfactory for peat, with 80 m. e. as the allowable minimum.

The effect of soil texture upon the growth of red and chestnut oaks, H. F. Scholz (*Black Rock Forest Papers, 1* (*1937*), *No. 11, pp. 76–79, fig. 1*).—Based on an analysis of records taken on 134 sample plots, the author reports that red and chestnut oaks on the Black Rock Forest cove areas made more rapid growth on light clay loam than on heavy clay loam or clay soils. Although the association between growth index ratio and soil texture was strongly significant, the correlation was not high, suggesting the the prediction of growth index ratio on the basis of soil texture would not be possible. One of the complicating factors is the differential growth between oaks originating from sprouts and from seed, the latter being inherently more vigorous.

The permanent fixation of sand dunes in Michigan, R. F. Kroodsma (*Jour. Forestry, 35* (*1937*), *No. 4, pp. 365–371, figs. 2*).—The author discusses procedure and different plant materials found effective in fixing moving sand dunes. The successive steps were (1) distribution of dead cover to hold the sand, (2) planting of hardwoods and cuttings, (3) planting of conifers, and (4) planting of winter rye. Black locust was one of the best hardwoods and ponderosa pine one of the best conifers. The rye, lasting but one season and therefore requiring repeated planting, was of great value in winter, not only in holding snow but in preventing movement of surface sand.

A yield table for northern hardwoods in the Lake States, S. R. Gevorkiantz and W. A. Duerr (*Jour. Forestry, 35* (*1937*), *No. 4, pp. 340–343*).—There is presented herein a yield table for average well-stocked stands of northern hardwoods, based on the average age and average diameter of the main stand. The volume on good sites at 80 yr. is indicated as 6,100 bd.-ft. Scribner and at 90 yr. as 7,325 bd.-ft. per acre.

The relation of crown diameter to cubic volume of one-seed juniper, J. Howell, Jr. (*Jour. Forestry, 35* (*1937*), *No. 9, pp. 829–831*).—A statistical study of the volumes of 124 one-seed juniper trees growing near Pine Springs, Ariz., indicated that crown width and trunk diameter at 1 ft. appeared to be the most important variables to consider in the compilation of volume tables for this species.

Open tank creosote treatment of shortleaf and loblolly pine poles, E. J. Downey (*Jour. Forestry, 35 (1937), No. 4, pp. 349–352, figs. 2*).—A method of treatment is described in which poles, first heated in a vat at temperatures ranging from 220° to 225° F. for 1 hr. were transferred at once to a cool vat at approximately 100° F. After from 1 to 1.5 hr. in the cool vat, penetration of about 1 in. was obtained. Transferred again to the hot vat, the expansion of the creosote not only drove out part of the surplus but also pushed the creosote more deeply into the wood, reaching an average depth of 1.83 in.

DISEASES OF PLANTS

The Plant Disease Reporter, November 1, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), No. 20, pp. 351–375*).—The following items of interest are included in this issue:

Fungi from decaying trees or other plants collected by the senior author during the years 1922–23 in the vicinity of Tela, Honduras, Central America, and some fungi found decaying railway ties of native woods in Honduras, both by O. A. Reinking and C. J. Humphrey; red leaf and blast of oats, by M. F. Barrus; disease losses in vegetable crops in Massachusetts, by O. C. Boyd; some reports on cotton diseases, including diseases of Acala cotton in Arizona and root diseases in Texas; diseases of herbaceous ornamentals in New York in 1937, by P. P. Pirone; and brief reports on plant diseases, including wheat stem rust in North Dakota, sweet corn diseases in Massachusetts, potato late blight in Maine, blight on apples in Maine, peach yellows in Massachusetts, rust on marigold in California, and root rot of Washington palm (*Washingtonia gracilis filifera*) in Arizona.

Annual report of the division of botany and plant pathology, M. T. Cook (*Puerto Rico Col. Sta. Rpt. 1936, pp. 39–46*).—Brief reports of observations and investigations are included on epidemics of bacterial fruit rot (*Bacterium lachrymans* [=*Phytomonas lachrymans*]) and tomato mosaic; new records for *B. lachrymans*, *Gloeosporium ampelophagum*, zinnia blossom blight, tuber rot of yautia due to *B. carotovorus* [=*Erwinia carotovora*], yam mosaic, papaya yellow mosaic (?), and *Peronoplasmopara* [=*Pseudoperonospora*] *cubensis* on Persian melons; sugarcane gummosis, dry top rot, and root diseases; bacterial wilt diseases of tomato and eggplant, cucumber downy mildew control by resistant varieties, control of black tip disease of bananas, and pineapple wilt; and virus diseases, including mosaics of cucumber, tomato, and crotalaria, and Cuban corn stripe disease; and a plant disease survey covering various crop plants.

Annual report of the assistant phytopathologist for the fiscal year 1935–1936, A. Roque (*Puerto Rico Col. Sta. Rpt. 1936, pp. 47–51*).—Progress reports are included on varieties resistant to tomato wilt disease (*Bacterium solanacearum* [=*Phytomonas solanacearum*]) and tobacco mosaic; control of cucumber downy mildew; a variety of eggplant resistant to bacterial wilt (*B. solanacearum*); and diseases of minor crops, including *Alternaria* spot of cotton, wilt of yams, fruit rot of cucumbers, fungus black tip of bananas, and fungus root disease of vanilla.

Abnormal germination resulting from improperly galvanized trays, W. F. Crosier, S. R. Patrick, and M. T. Munn (*Phytopathology, 27 (1937), No. 8, pp. 867, 868, fig. 1*).—This contribution by the New York State Experiment Station reports injury to germinating seeds of vegetables, flowers, and solanaceous plants by zinc from improperly galvanized trays.

Combining heat and formaldehyde for soil treatment, K. G. Beachley (*Pennsylvania Sta. Bul. 348 (1937), pp. 19, figs. 7*).—Formaldehyde plus steam

vapor as applied with the apparatus described made it possible to shorten the soil-treatment period by the inverted pan and to increase the efficiency of this method for disinfecting cold, wet soils. Vaporized formaldehyde was driven into the soil as deeply as steam, while the same amount applied as a drench penetrated only as deeply as the water. By combining as small an amount of formaldehyde as 1 lb. per 100 sq. ft. with steam vapor, a 20-min. treatment proved as effective for disinfecting seedbeds as a 30-min. treatment with steam vapor alone. The initial soil moisture content limited the penetration of steam vapor. In Hagerstown silt loam, disinfection to a 6-in. depth resulted with 30 min. steaming in soil containing not more than 15 percent moisture. Application to seed flats of 0.097 oz. of formaldehyde per 1 sq. ft. as a vapor in 15-min. periods protected seedlings against damping-off during and after seed germination as well as the steam-box method for 90 min. and it also reduced the need for seed treatment. Soil treatment with formaldehyde plus steam vapor made it possible to plant most vegetable and flower seeds 24 hr. thereafter. Tobacco seedbed treatment by steam vapor, alone or with formaldehyde, gave as satisfactory results as steam engine treatment.

The cost of disinfecting seedbeds with steam vapor alone for 30 min. was about $1 per 100 sq. ft. By combining 1 lb. of formaldehyde per 100 sq. ft. with the steam vapor and shortening the treatment period to 20 min., the cost was reduced to about 80 ct. per 100 sq. ft.

The toxicity of copper-lime-arsenic mixtures to certain phytopathogenic fungi grown on malt agar plates, D. H. Palmiter and G. W. Keitt (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 6, pp. 439–451, figs. 4*).—The toxicity of certain copper-lime-arsenic mixtures and of their separate ingredients was studied by the Wisconsin Experiment Station, using a modification of the method of H. Schmitz and others on the test organisms *Venturia inaequalis*, *V. pyrina*, *Cladosporium carpophilum*, *Phyllosticta solitaria*, *Elsinoë veneta*, *Glomerella cingulata*, *Physalospora obtusa*, and *Sclerotinia fructicola*. Suitable copper-lime-arsenic mixtures proved highly toxic to all these fungi, and toxicity of such mixtures could be varied through a wide range by formula modifications. Copper sulfate-lime mixtures had relatively low toxicity. The toxicity of the arsenical compounds tested varied through a wide range. Monocalcium arsenite was the most toxic, usually being from 3 to 10 or more times as toxic as $CuSO_4$, depending on the fungus used. Tricalcium arsenite was slightly less toxic. Zinc and iron arsenites were comparatively low in toxicity, while paris green and copper arsenite were intermediate. Tricalcium arsenate was the least toxic arsenical compound tested, and dicalcium arsenate was only slightly more so. Six monoconidial isolates of *V. inaequalis* showed about as much variation in reaction to $CuSO_4$ and certain arsenites, respectively, as did species of six other genera. The toxicity of the copper-lime-arsenite mixtures studied usually exceeded the summation of the toxicities of their separate ingredients. It is shown in tests with *Gibberella saubinetii* that suitable copper-lime-arsenic mixtures liberate soluble materials capable of diffusing through an acid, neutral, or alkaline medium and of exercising fungicidal action at considerable distances from the undissolved residues.

Restoration of virulence of attenuated curly top virus by passage through susceptible plants, C. F. Lackey (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 6, pp. 453–460, figs. 6*).—The virulent sugar beet curly top virus, after passage through *Chenopodium murale*, becomes attenuated so that it produces only mild symptoms on test beets. This attenuated virus was restored to practically its original condition of virulence by a single passage through chickweed (*Stellaria media*). Sugar beets in the cotyledon stage occasionally

restored the virulence to the attenuated virus in like manner and may have an economic bearing on the curly top problem. Alfileria (*Erodium cicutarium*) and peppergrass (*Lepidium nitidum*), important overwintering hosts for both the leafhopper vector and the virus, also restored the virulence to the attenuated virus. Restoration occurred most frequently in alfileria when the plants were growing rapidly. A greater number of young, fast-growing plants and those fertilized with ammonium sulfate 10 days before inoculation restored the virus than older or untreated plants, but none of these procedures had any pronounced effect on the degree of restoration attained.

Contribution to the study of Phytophthora cambivora: Morphology, cytology, and pathogenic action of the parasite, A. Allain (*Contribution a l'étude du Phytophthora cambivora: Morphologie, cytologie, et action pathogène du parasite. Paris: Firmin-Didot & Co., 1935, pp. 127, pls. 16, figs. 18*).—Following a general historical account on the fungus (with about 17 pages of literature references) and a description of the technics here used, the main text of this monograph concerns a biological study of the parasite with description of the media used; the morphology of the mycelium, sporangium, spores, and oogonium; the cytology of the fungus, including descriptions of the chondriome, nucleus, and vacuome; and the host-parasite relations.

Physiologic races of Tilletia tritici and T. levis, H. A. Rodenhiser and C. S. Holton (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 7, pp. 483–496*).—In this study by the U. S. Department of Agriculture in cooperation with the West Virginia, Minnesota, Montana, Washington, and Oregon Experiment Stations, 24 collections of *T. tritici* and 29 of *T. levis*, each of which had been identified as a distinct physiologic race by previous investigators, together with a number of miscellaneous collections of both species were tested under comparable conditions at the several experiment stations. Eleven races of *T. tritici* and 8 of *T. levis* proved to be pathogenically distinct and were assigned letters and race numbers T–1 to T–11 and L–1 to L–8, respectively. Turkey (C. I. 6175) and Mindum (C. I. 5296) differed in susceptibility to certain races of both species when grown under different environal conditions. This variation appears to be due to the effect of environment on the host rather than on the fungus and was expressed only in the reaction of certain varieties to certain physiologic races. Several agronomically desirable wheats were resistant to a number of races of both fungi. It is concluded that it should be possible to obtain hybrids in which factors governing resistance to all of the known races of *Tilletia* are combined with those governing other desirable agronomic characters.

Heterothallism in Venturia inaequalis, G. W. Keitt and D. H. Palmiter (*Science, 85* (*1937*), *No. 2212, p. 498*).—In this study by the University of Wisconsin evidence is presented which "seems to justify the conclusion that *V. inaequalis* is heterothallic, each isolate being hermaphroditic and self-sterile."

Factors affecting chlorosis in irrigated wheat, D. W. Robertson and R. Gardner (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 7, pp. 511–520, figs. 2*).—Tests conducted by the Colorado Experiment Station with Marquis wheat irrigated at germination with 6 in. of water indicated that (1) irrigation water temperatures of 40°–60° F. have no effect on grain or straw yield; (2) addition of nitrogen fertilizer to the crop immediately after irrigation prevents the chlorotic condition often observed in young wheat after heavy rains or applications of irrigation water and increases the grain yield; (3) irrigation water washes the soluble nitrate nitrogen below the 3-ft. level; (4) yields of both straw and grain are increased by applications of calcium nitrate, ammonium acid phosphate, and ammonium sulfate in the order named; (5) in plats

treated with calcium nitrate the nitrate nitrogen content was high in the first 6 in. of soil, while in plats receiving no nitrogen the nitrate nitrogen content was significantly lower; and (6) applications of manganese sulfate, iron sulfate, and superphosphate did not alter the chlorotic condition or increase the yield over the nontreated plats.

Dissertation on the cause of the corruption and smutting of the kernels of wheat in the head and on the means of preventing these untoward circumstances, M. Tillet, trans. by H. B. Humphrey (*Phytopath. Classics No. 5 (1937), pp. 191*).—Single-handed and alone, in the mid-eighteenth century, the author applied himself assiduously to the development of the scientific method in solving agronomic problems. In this early monograph, while not suspecting the true origin and function of the bunt dust, he was able to prove that the disease resulted from contamination of the seed with this dust, which he concluded was the act ve agent in transmitting a self-perpetuating poisonous principle.

The effect of various dusts upon the rate of seeding of various vegetable seeds, O. H. Pearson (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 559–561*).—Using a common gravity type of seeder (described) under controlled conditions, the tests here reported with dusts commonly employed in vegetable seed treatment appear to indicate that the application of dust on certain seeds may increase the rate of seeding as much as 23 percent in some cases, while in others it may decrease the rate fully as much. The direction and amount of change appeared to be correlated with the surface and density of the seed. Thus seeds with smooth coats (e. g., kohlrabi, Chinese cabbage, radish, and lettuce) were retarded by application of dust, while rough-coated seeds (e. g., spinach, carrot, beet, tomato, parsnip, and small seeded peas) showed an appreciable acceleration of seeding rate due to the dust. It has been reported that the addition of graphite dust to pea seed restores the seeding rate to practically normal, but similar treatment of other seeds failed to give consistent results; e. g., it actually depressed the rate with carrot and lettuce seed. From the results obtained, "it would appear that the rate of seeding of vegetable seeds treated with finely ground dusts varies, and that growers must be cautioned to adjust planters to retain a normal rate of seeding."

Fusarium resistance in Wisconsin All Seasons cabbage, L. M. Blank (*Jour. Agr. Res. [U. S.], 55 (1937), No. 7, pp. 497–510, figs. 4*).—This paper reports a cooperative study by the U. S. D. A. Bureau of Plant Industry and the University of Wisconsin on two types of resistance of Wisconsin All Seasons cabbage to the yellows organism (*Fusarium conglutinans*). Type A resistance, due to a single dominant gene, is apparently similar to that described for other varieties of cabbage and for brussels sprouts and kohlrabi. A second type of resistance, referred to as type B, is similar to that described for Wisconsin Hollander and is apparently influenced by several genetic factors. Its most effective expression was at the lower soil temperatures, while at higher soil temperatures (about 24° C.) plants having only type B resistance succumbed to the disease. Under field conditions type B resistance was effective in different degrees in the several progenies. In greenhouse trials, under semicontrolled and controlled soil temperatures, type B resistance was partially expressed, resulting in a delayed and less severe development of the disease. In the greenhouse trials, as in the field, different progenies showed differences in the rate and severity of disease development, indicating various degrees of type B resistance.

Injury to cabbage by lightning, J. C. Walker (*Phytopathology, 27 (1937), No. 8, pp. 858–861, figs. 2*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the University of Wisconsin, it was found that a dis-

charge of lightning kills the plants in its immediate vicinity and injures nearby plants at the ground level of the stem on the side facing the discharge. The surface lesion and injury to the cortex, phloem, and xylem are relatively slight. The pith cells are killed, and a cavity is formed in which adventitious roots arise. A common response also is stimulation of the bud at the leaf scar just below the point of injury. When surface injury is more severe, the adventitious roots are stimulated above the point of injury. If the subterranean cortex is generally damaged, adventitious roots may arise from all the leaf scars involved. With injury at the soil line there is excessive root formation and stunting of the lower stem, followed by nearly normal enlargement of the upper stem. If the injury is chiefly to the pith the shock is temporary, but if the surface damage is more severe the growth and yield are reduced accordingly.

"Slip-down," a recently discovered virus disease of hops, R. O. MAGIE (*Farm Res.* [*New York State Sta.*], *4* (*1937*), *No. 1*, *pp. 10, 13*, *figs. 2*).—This trouble, recognized in 1935 as a virus disease, has occurred in the State for at least 30 yr., and it is estimated that affected plants average less than a fourth of the normal yield. It has been demonstrated (1937) in a preliminary way that the virus is spread by the hop aphid. Vine growth on diseased plants is slender, with abundant weak laterals, making the hill appear squat and bushy. The leaves are curled and about half the normal size. A chlorotic ring-spot pattern develops on a few leaves of all affected plants in July, this pattern disappearing in older leaves, which become abnormally dark green. Oregon Late Cluster hops have shown no evidence of the disease until 2–3 yr. after introduction. An important part of the control program thus consists in the building up of a virus-free stock of the English Cluster type of hops to form a nucleus from which growers may make replacements and start new yards.

Legume viruses in Idaho, W. H. PIERCE (*Phytopathology*, *27* (*1937*), *No. 8*, *pp. 836–843*, *figs. 2*).—Continuing these studies by the Idaho Experiment Station (E. S. R., 75, p. 62), virus-infected legumes were collected from various sections of the State and tested in the greenhouse on Stringless Refugee Green beans, Asgrow 40 peas, and Perfection peas, the viruses being roughly identified by their reactions on these three hosts. Most legume hosts proved to be subject to more than one virus, but one virus generally predominated in the infections on each species. Thus the majority of infections on red clover were due to pea virus 3 and those on sweetclover to bean virus 2. However, since in certain sections other viruses might predominate on individual species, it seems essential, in referring to legume mosaics, to include the identity of the virus or viruses concerned.

It was demonstrated that some legumes may serve as overwintering hosts of certain viruses attacking annual crops. Thus sweetclover carried over bean virus 2, causing yellow mosaic of beans, and red clover undoubtedly serves as an important overwintering host of pea virus 3, causing common mosaic of peas. No other host than peas was found for enation pea-mosaic virus. However, since only two cases were found, it is quite possible that in regions where this virus is prevalent overwintering hosts may occur.

Of the viruses found on peas and beans in Idaho, the most important, economically, appear to be the common pea-mosaic virus (pea virus 3), which is severe on green pod peas in certain sections, the common bean-mosaic virus (bean virus 1) on susceptible bean varieties, and the sugar beet curly top virus, which may completely destroy stands of susceptible beans in years when the beet leafhopper is prevalent.

The influence of various soil factors upon potato scab caused by Actinomyces scabies, R. W. GOSS (*Nebraska Sta. Res. Bul. 93* (*1937*), *pp. 40*,

fig. 1).—Scab severity was found to be correlated with the amount of soil inoculum, which was in turn affected by the degree of competition with other soil micro-organisms. Soil sterilization before inoculation gave the most severe infection, which was greatly reduced by addition of unsterilized soil filtrates or organic matter (manure) and by delaying inoculation until soil saprophytes had become established. *A. praecox* added to the soil in amounts about equal to those of *A. scabies* failed to reduce the severity of scab, as reported by others. Sterilized soils inoculated with *A. scabies* and incubated below 22° C. failed to induce as much scab as those incubated at 22°–30°, all being held at 22° during the infection period. Unsterilized soils did not show this temperature effect.

In the majority of the tests the most scab occurred in dry soils, but in a number of cases the occurrence of severe deep scab in soils held at or near the saturation point failed to indicate the effective control by high moisture reported in several publications. The results of one test, while not conclusive, indicated that caution should be used in comparing the effects of soil moisture in different soil types. The largest amounts of scab occurred in soils held at medium or high moisture contents for some months previous to planting. While results were not always consistent, there was no indication that high soil moisture had a depressing effect on the development of *A. scabies*, as determined by subsequent infection. *Actinomyces* counts in soil dilution plates and on soil slides did not check with each other, nor did either show consistent relationships to soil moisture or to scab. In general, the *Actinomyces* percentage was greatest in the drier soils, but the numbers were sometimes greater with high moisture in contrast with the reported inhibition by high soil moistures. A lack of soil aeration preceding tuber formation had a greater effect than during the infection period, and in both cases scab was decreased. The type of scab appeared to be determined by host reactions, environments, and virulence of culture. Common, deep, and raised scab often occurred on the same tuber in sterilized soil inoculated with a single pure culture. Superficial or russet scab occurred only in the unsterilized soils and may have been due to another *Actinomyces* strain or species.

The development of an experimental technic permitting study of the pathogen in the soil immediately surrounding the susceptible plant tissues, as contrasted with the present gross methods, is deemed essential for determination of the effect of many of these soil factors on the disease.

Studies on Rhizoctonia solani Kühn.—II, Effect on yield and disease of planting potato sets infested with sclerotia, G. B. Sanford (*Sci. Agr.*, *17* (*1937*), *No. 10*, *pp. 601–611*; *Fr. abs.*, *p. 611*).—Continuing this series (E. S. R., 77, p. 798), the effect on yield and disease of planting potato sets bearing sclerotia of *R. solani* was studied during 4 yr. in 36 tests and under a wide range of soil types and crop sequences. In general, the use of yield of large or small tubers, total yield, yield of deformed tubers, or sclerotia on tubers at harvest proved unreliable as criteria for determining the relative value of tuber treatments. Although percentage of stem infection would be fairly reliable as indicating both soil infestation and control by treatment during the early growth period, it is deemed important, if not essential, to determine the effect of the disease on the stolons if control is to be measured in terms of yield. The yield of large tubers was the most reliable criterion used, giving expected results in about 40 percent of the tests. An average of about 58 percent of the plants from sclerotium-bearing sets had no disease lesions on the stems.

The laboratory method of determining the relative lethal effects on sclerotia and the general suitability of various tuber treatments is suggested as preferable to ordinary field tests.

Diseases of the farm crop (*Montana Sta. Rpt. 1936, pp. 21, 22*).—A brief progress report of investigations on crop rotations and major diseases in relation to sugar beets.

Root rot of C. P. 28/19 on heavy soils controlled by summer planting, R. D. RANDS and E. V. ABBOTT (*Sugar Bul., 15 (1937), No. 19, pp. 3, 4, 6*).—A review of seasonal and crop conditions and a summary of the authors' findings indicate the value of summer planting for control of root rot in this earliest maturing variety of sugarcane. Other varieties are compared as to resistance.

Why blossom-end rot of tomatoes was troublesome this season, C. B. SAYRE (*Farm Res. [New York State Sta.], 4 (1937), No. 1, p. 6*).—"With 1937 regarded as a 'wet' year, losses exceeded those of 1936, a drought year when this trouble is generally most noticeable. Uniform moisture supply is principal remedy."

An indication of seed transmission of mosaic virus in tomato seed, J. A. MILBRATH (*Phytopathology, 27 (1937), No. 8, pp. 868, 869*).—Since seed from a selection of the Indiana Canner variety tested by the Oregon Experiment Station consistently gave a few mosaicked seedlings, it is concluded that seed transmission of tomato mosaic can occur. The percentage of transmission was inversely proportional to age of seed.

The use of borax in controlling dark center of turnips, G. B. SNYDER and R. W. DONALDSON (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 480–482*).—The various field trials here reported from the Massachusetts State College are said to indicate definitely that "(1) borax will control dark center of rutabagas, (2) boron is deficient in many soil areas of the State if dark center of rutabagas is a fair indicator of such a deficiency, (3) ordinary soil amendments commonly used by the grower do not supply sufficient boron to prevent dark center, and (4) from 10 to 20 lb. per acre of borax applied as a powder or spray completely controlled dark center of rutabagas on the varied soils of Massachusetts if applied in drill. When borax is applied broadcast, 20 to 30 lb. were indicated." Observations further show that more work must be done to determine the effect of repeated applications of borax to the soil and the most practical procedure for applying it.

Observations on the yam nematode (Rotylenchus bradys (Steiner & LeHew, 1933)) Filipjev, 1936, G. STEINER (*Phytopathology 27 (1937), No. 8, pp. 865–867, fig. 1*).—It is proposed to designate the nematode *R. bradys*, hitherto observed only in various yams (*Dioscorea alata*, *D. cayenensis*, and *D. rotundata*), as the yam nematode. New observations on its occurrence in Jamaica, Puerto Rico, and Cuba are mentioned, and the symptoms on yam roots are described and illustrated.

A histological evaluation of low temperature injury to apple trees, F. H. STEINMETZ and M. T. HILBORN (*Maine Sta. Bul. 388 (1937), pp. 32, pls. 7, figs. 8*).—Low temperature injury to apple trees first becomes apparent in the death of the parenchymatous protoplasts, followed by vessel occlusion with a wound gumlike substance, which together form the "blackhearted wood." Ultimate recovery of the injured wood apparently depends on the development and maintenance of sufficient foliage to promote growth. Anatomically, this is possible only when subsequently some storage cells remain alive and the xylem continues capable of conduction. In no case was the dormant cambium found injured, even at temperatures lower than ever recorded in the orchards. Microscopic examination of the woody tissues of branches indicated that if approxi-

mately 50 percent of the vessels are occluded they will not recover, but with only 25 percent occluded recovery is probable. Similarly, with about 50 percent of the parenchyma cells killed the branch may not recover, but with only 20 percent killed recovery is probable. Freezing tests indicated that the injury following the severe winter of 1933–34 occurred in November 1933 rather than during the following winter. Definitely nonhardy varieties (e. g., Baldwin) were injured if frozen in November, but if permitted to harden off they could withstand lower temperatures than ever recorded by authoritative weather records. Study of the latter showed severe test winters to be characterized by low November temperatures.

A literature review revealed at least four causal agencies of abnormal parenchymatous wood. By definition and original illustrations in source material, it is believed that there should be no confusion between "pith flecks" and "frost rings." Data given by some investigators supporting the theory that drought can cause a similar malformation are not considered sufficient. It was proved experimentally that compression of the cambial cells and lateral displacement of the wood rays are characteristic of low temperature injury in woody plants. If this is accepted as a criterion of frost injury it would differentiate frost rings from other types of parenchymatous wood. In the trees examined, the parenchymatous wood increased in the longitudinal axis as older parts of the trees were reached and failed to decrease as indicated by previous investigators. A literature list of 55 entries is appended.

The control of drought spot and corky core of the apple in British Columbia, H. R. McLarty, J. C. Wilcox, and C. G. Woodbridge (*Wash. State Hort. Assoc. Proc., 32 (1936), pp. 142–145*).—Investigations of these and related apple troubles have indicated that deficient or excess soil moisture favor the diseased conditions, though improvement of these factors has not always effected a cure. Nitrogen fertilization in various forms also increased the symptoms. Heavy potash applications in some cases lessened the disease, but phosphate gave no apparent assistance. On the other hand, chemicals containing boron have effected complete cures whether injected into the tree trunks, sprayed on the leaves, or applied to the soil. Data from chemical analyses of fruit further confirmed the relationship between boron deficiency and drought spot severity under British Columbia conditions. No relationship was found with bitter pit or water core. See also a previous note (E. S. R., 77, p. 645).

Studies of the pathogenicity of Physalospora obtusa, H. H. Foster (*Phytopathology, 27 (1937), No. 8, pp. 803–823, figs. 7*).—Of 41 different isolates of *P. obtusa* from various regions used in apple-leaf infection studies under greenhouse conditions at the University of Wisconsin, only 13 induced leaf infection consistently. None of the 25 apple varieties tested proved immune to frogeye leaf spot. Pycnospores produced on potato-dextrose agar were atomized on the dorsal surface of apple leaves. Trees receiving the optimal treatment for infection were then kept in a moist chamber at 20° C. for 24 hr., after which they were held on the greenhouse bench at least 14 days before the total number of lesions was recorded per 0.5 sq. in. of maximally infected area per leaf. Macroscopic symptoms were apparent on trees kept in the moist chamber for 24 hr. at 12°–28°, with maximal infection developing at 20°. An 8-hr. period in the moist chamber at 20°, following inoculation, was the minimal period necessary for development of macroscopic symptoms. The minimal incubation period of the isolates consistently inducing leaf infection varied from 20 to 96 hr. Stomatal infection was demonstrated and is probably the chief mode of entry. Mature pycnospores usually developed within 1–2 weeks

when leaves bearing immature pycnidia were held over moistened filter paper in Petri dishes. No definite correlation was found between the ability of isolates to induce frogeye leaf spot and black rot of the fruit. The leaf lesions were more numerous and the coalescing spots of more general occurrence on the young, actively growing than on the more mature leaves. Tests with the various isolates used indicate that the leaf-infecting strains occur less frequently in the upper Mississippi Valley than in certain of the Eastern States.

Soft scald of Jonathan apples in relation to respiration, M. H. Haller and J. M. Lutz (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 173–176, fig. 1*).—"Holding Jonathan apples at 70° [F.] previous to storage at 32° influenced the amount of soft scald, which generally increased to a maximum with 6 to 9 days' delay at 70° and subsequently decreased. The respiratory rate of Jonathan apples at 70° generally increased for a period and subsequently decreased. The extent and rapidity of the increase varied considerably with the different lots. There was no apparent relation between the respiratory rate and the maturity of the fruit or between the respiratory rate at 70° at the time of transfer and the amount of soft scald that developed at 32°."

Potentialities of eradicant fungicides for combating apple scab and some other plant diseases, G. W. Keitt and D. H. Palmiter (*Jour. Agr. Res. [U. S.], 55 (1937), No. 6, pp. 397–437, figs. 7*).—In this contribution, representing the results of 12 yr. of work by the Wisconsin Experiment Station, the accomplishments and limitations of plant disease control by protectant spraying are discussed, and attention is invited to the need for increased development of control programs of complementary procedures based on the principles of immunization and eradication as well as protection. A report is given of studies of potentialities for increased use of eradicant chemical measures for direct attack upon the pathogen, with the aim of reducing it to a survival level at which it can be more surely and economically controlled.

The studies on apple scab (*Venturia inaequalis*) were projected along three major lines: (1) Materials and methods for chemical eradication, (2) effects of eradicant procedures on epidemiology and control, and (3) large-scale orchard tests of the feasibility of adapting eradicant chemical measures to practical control. In small-scale experiments many materials were tested in a single spray treatment after harvest and before many leaves had fallen, aimed at the ascospores. Various aqueous mixtures of copper sulfate, milk of lime, and certain arsenicals (chiefly calcium and zinc arsenites) were highly effective, often completely preventing production of ascospores in individual tests. The results with over 200 formulas are reported and discussed. Many mixtures caused severe host injury, while others showed high fungicidal effectiveness without serious injury thus far to the host. Further studies are necessary to determine which formulas are best and whether they are safe enough for orchard use. In two seasons the epidemiology of apple scab was studied comparatively in two small orchards about 100 yd. apart, one sprayed with copper-lime-arsenic mixtures in the fall only and the other unsprayed. Scab development in the sprayed orchard was strikingly retarded and reduced. Certain confirmatory orchard observations are reported. A spring treatment of the fallen leaves with an ammonium sulfate solution killed the ascocarps of the fungus. The studies on apple scab have not yet reached a stage warranting large-scale trials on the feasibility of adapting the eradicant chemical discussed to practical use.

The small-scale exploratory tests of the potentialities of copper-lime-arsenic mixtures for suppressing primary inocula were made in relation to eight other phytopathogenic fungi. Fall spraying of pear and cherry (*Prunus cerasus*)

leaves infected, respectively, by *V. pyrina* and *Coccomyces hiemalis* and dormant spraying of chokecherry and raspberry infected, respectively, by *Dibotryon morbosum* and *Mycosphaerella rubina* were highly effective in suppressing ascospore production. Dormant spraying was highly effective in suppressing conidium production by *Sclerotinia fructicola* on overwintered persistent mummified fruits of plum (*P. domestica*) and partly effective in suppressing pycnospore production by *Phyllosticta solitaria* on apple and conidium production by *Cladosporium carpophilum* and *V. pyrina* on peach and pear, respectively. It was highly effective against sclerotia, mycelia, and basidiospores of *Corticium koleroga*, appearing to give satisfactory control of the thread blight of fig. In greenhouse trials in infested soil, copper-lime-arsenic dusts gave somewhat better control of wheat bunt (*Tilletia tritici* and *T. laevis*) than did commercial copper carbonate or ethyl-mercury-phosphate dusts.

The studies reported show (1) that the toxicity of copper-lime-arsenic mixtures can be varied through a wide range of control by choice of the arsenical component, modifications in the amounts and proportions of the ingredients, and the use of amendments; (2) that these preparations liberate soluble materials that are capable of diffusing through an acid, neutral, or alkaline medium and exercising fungicidal action at considerable distances from the undissolved residues; (3) that suitable mixtures are highly effective against fungal fruiting structures at the surface, or near a permeable surface, of invaded tissues; and (4) that many phytopathogenic fungi are potentially vulnerable to attack by surface applications of eradicant fungicides.

Leaf growth as affected by spray materials, W. D. Mills (*N. Y. State Hort. Soc. Proc., 82 (1937), pp. 211–214*).—Using a camera, the size of the leaves on tagged terminals was recorded at frequent intervals by Cornell University from the first appearance of leaves until the rapid growth period was over, and again in the fall. In one McIntosh orchard no appreciable leaf scorch occurred, and there was no difference in total leaf growth as between terminals receiving five spray schedules. In another orchard in a different county considerable leaf scorch appeared, and there were significant differences in leaf growth under the different schedules after the calyx spray, these being greatest about mid-June. Where leaf scorch did not occur there was no stunting of growth from lime-sulfur as compared with wettable sulfur, but where leaf scorch was visible measurable differences in leaf growth were noted. Data are also included for several seasons on the effects of various spray schedules on the yield of fruit.

Summer fungicides on apples in western New York, J. M. Hamilton (*N. Y. State Hort. Soc. Proc., 82 (1937), pp. 39–48*).—This paper summarizes experiences by the New York State Experiment Station and gives detailed results with various sulfur and copper preparations tested in the cover sprays (1936). From this season's experiences it would seem that lime-sulfur after the first cover spray may be dangerous. Wettable sulfur in the calyx and first cover sprays means that by then scab is fairly well under control, and, if so, the July cover sprays may perhaps omit a fungicide unless wet weather sets in. A fungicide in every other spray or, perhaps better, one of low concentration in every spray should be effective. The most important factor is believed to be a fungicide in the last spray to protect against secondary infection from fall rains. A copper spray may be better for the cover sprays, but for the first ones sulfur is preferred unless oil is to be used in the second and third covers for codling moth. If a copper spray must be used and yet residue is to be avoided, a bordeaux substitute should be employed in the cover sprays. Where residue is of no concern, a weak bordeaux mixture should prove satis-

factory and afford good summer protection against scab. To avoid fruit spotting, a spreader should be used with bordeaux sprays.

The effect of boron, manganese, and zinc on the control of apple measles, H. C. YOUNG and H. F. WINTER (*Ohio Sta. Bimo. Bul. 188 (1937), pp. 147–152, figs. 5*).—As here discussed, "measles" concerns primarily the pimply and internal bark necrotic condition of Red Delicious apple trees. Repeated efforts to isolate a possible causal agent, attempts to transfer the malady by grafting or budding, general fertilizer tests, and use of various cover crops all led to negative results. However, the occasional recovery of a tree or group of trees suggested that the actual cause might lie in a deficiency of one or more of the so-called minor elements. Accordingly, several field and pure culture solution tests were set up to determine the effects of boron, manganese, and zinc on the control of this disease.

The evidence obtained pointed strongly to the conclusion that lack of boron in a growing Delicious tree is responsible for much of the condition called internal necrosis. It has not been proved that the artificially induced pimples and necrosis are identical with the measles as it occurs in the orchard, but the fact remains that the induced necrosis in these tests could not be distinguished either macroscopically or microscopically from measles, and in these tests boron corrected the condition.

Although no definite recommendations are made from these results, there seems little likelihood of injury from a moderate application of boron and it is suggested that ⅛–¼ lb. of borax per year of a tree's growth (e. g., 1½–2½ lb. for a 10-year-old tree) be tried on measles trees. It is emphasized that boron can injure severely and that trees need but a small amount.

Infectivity of the fire-blight organism, E. M. HILDEBRAND (*Phytopathology, 27 (1937), No. 8, pp. 850–852*).—In this study from Cornell University, single cells of *Erwinia amylovora* [=*Bacillus amylovorus*] were found capable of producing apple blossom infection when introduced into the nectary. The cause for failure in pear was attributed to desiccating influences and to contaminating organisms having ready access to the exposed nectaries. The function of apple nectar as a growth medium for single bacterial cells was indicated when growth occurred in nectar aseptically removed and kept in deep-well slides. A minimum of about 4 and 75 cells, respectively, was required for growth in sterile juice extracted from green fruits and succulent shoots of pear.

This study clarifies an important point bearing on the minimal numbers of bacteria required for infection and indicates the potentialities of infection from the presence of a single live canker in an orchard.

The blossom-blight phase of fire blight, and methods of control, E. M. HILDEBRAND (*[New York] Cornell Sta. Mem. 207 (1937), pp. 40, pls. 3, figs. 5*).—In addition to eradication methods, these studies indicate that supplementary measures such as blossom blight control should be included. In the laboratory the more promising bactericides strongly inhibited pollen germination, but in field tests no appreciable reduction in fruit set resulted under good pollination conditions, nor was fruit or foliage injury observed following bactericidal applications during bloom. Under laboratory conditions, low concentrations of bactericides (such as would be used in the field) acted to a certain extent as repellents to honeybees but had a tendency to lengthen their life span, and field observations failed to show any deleterious effects on them. Except for certain natural openings (stomata, etc.), the entire surface of flowers or fruit is protected by a layer of cutin, and the fire blight bacteria appeared to enter unwounded flowers of the pome fruits only through these openings. The

only fully demonstrated overwintering of the bacteria takes place in tree cankers, and it is deemed highly improbable that it occurs in beehives.

Laboratory tests indicated that concentrations of bordeaux mixture (1–3–50) as low as 1/64 normal strength are capable of killing the pathogen in 10 min., and that neither $CuSO_4$ nor lime is as toxic when used alone or in other combinations. Sulfur added to bordeaux mixture reduced the toxicity, but zinc powder had little effect. Of the dyes tested, brilliant green and malachite green were highly toxic to the bacteria, but practically lost this property when mixed with bentonite. Copper-lime dust (20–80) and a number of other such combinations were found to offer promise, and, again, sulfur and zinc additions had the same effects as above noted. The highest susceptibility to infection was found during the 2 days after opening of the flowers, with a steady decline thereafter. The most effective time for applying bactericides proved to be simultaneously with that of the bacteria. When applied at different times during the blooming period the most effective single treatment proved to be that at full bloom, when about 75–80 percent of the flowers were open. The averages of infected blossoms for the respective applications at early bloom, full bloom, late full bloom, early and full bloom, and daily during bloom, and for the controls, were 74, 41, 62, 26, 7, and 92 percent.

The field tests indicated that bactericidal applications always reduce blossom infections, that the time for the most effective single application is at full bloom, and that bordeaux mixture (1–3–50) and copper-lime dust (20–80) are the most effective of the materials tried. Under certain conditions the early bloom application proved nearly as important. Furthermore, in limited trials, cuprous oxide, copper phosphate, and Coposil were found to offer some promise. The comparative effectiveness of sprays and dusts may depend in part on the thoroughness of flower coverage.

Maternal inheritance in pears, S. L. Hsiong and E. M. Hildebrand (*Phytopathology, 27 (1937), No. 8, pp. 861, 862*).—Observations by the authors from Cornell University on crosses of several horticultural varieties of *Pyrus communis* with the Kieffer variety indicated that some influence in the maternal parent operates in the inheritance of certain tree characters and in resistance to fire blight (*Erwinia amylovora* [=*Bacillus amylovorus*]).

Peach canker investigations.—*III, Further notes on incidence, contributing factors, and related phenomena*, R. S. Willison (*Canad. Jour. Res., 15 (1937), No. 7, Sect. C, pp. 324–339, figs. 5*).—Continuing this series (E. S. R., 75, p. 366) it was found that "the relative importance of the different sources of canker varies from year to year. Some, e. g., pruning wounds and injuries from verticilliosis, become less, while others, such as dead twigs and fruit pedicels, become more significant with time. Still others show no definite trends but fluctuate according to conditions. Leaf scars are vulnerable for a time after leaf fall, because of a temporary absence of wound periderm in the leaf base, but the development of cankers from leaf scar infection is determined by an infrequent coincidence of physiological and meteorological factors.

"Some insects, such as the oriental fruit moth (*Laspeyresia molesta* Busck.), the shot-hole borer (*Scolytus rugulosus* Ratz.), and the peach borer (*Synanthedon exitiosa* Say.), can cause injuries which frequently become cankered afterward. The lesser peach borer (*S. pictipes* G. & R.) is seldom a primary parasite but may stimulate necrotic processes through its destruction of callus in cankers. The peach is most susceptible to canker in the fall, and injuries such as pruning cuts made at that time are much more subject to infection than those made at any other time of the year. The incidence of peach canker and of winter injury can also be increased significantly by prolonging the period of

open cultivation. At least three types of winter injury have been observed, all of which may give rise to serious cankers. From 75 to 85 percent of the open cankers of all ages overwintering on the tree remain active. There is also a tendency for cankers to become less active with increasing age. Surgical treatment of important cases is of considerable value."

Nematode-resistant peach rootstocks of superior vigor, L. M. Hutchins (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 330–338, figs. 8*).—Infestation with *Heterodera marioni* is undoubtedly a weakening factor in most peach producing areas of the Southeast, and the finding of rootstocks resistant to it offers a promising method of control. To this end peach trees propagated on rootstocks of plum, apricot, almond, and several varieties of peach have been tested in experimental nurseries and orchards (1925–36) at Fort Valley, Ga. As a result two peach rootstocks of superior vigor, viz, F. P. I. 63850 (Shalil) and F. P. I. 61302, have proved resistant and satisfactory in orchard tests. Further tests, using the Early Hiley variety, indicated that its blooming response and fruit ripening dates were but little affected by the rootstocks on which the trees were grown.

"Kelsey spot" of plums in California, E. L. Proebsting (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 272–274, fig. 1*).—In these studies from the University of California, the findings seemed at first to confirm the theory that the trouble might be a type of drought spot, but recent work by B. J. Dippenaar[2] in the Union of South Africa, where the trouble is much worse, has definitely established high temperature as the cause there. A reexamination of the author's studies and observations in the light of this work showed that all the data can be interpreted as indicating heat rather than drought as the cause.

Summer pruning reduced the trouble somewhat, but gave more sunburned fruits. Burlap shelter and summer cover crops were more successful. Judged by past experience, the trouble does not seem liable to become excessive in California, but where some control appears desirable and abundant water is available for irrigation, "the use of a summer cover crop seems to minimize the injury."

A chlorosis of cultivated blueberries, J. S. Bailey (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 395, 396, fig. 1*).—The chlorosis described in this contribution from the Massachusetts Experiment Station occurred most often in those parts of a field where the soil was low in organic matter and rather dry. No direct correlation was found with soil reaction. Various soil treatments were tried in an attempt to overcome the trouble, but thus far the results warrant only the statement that "this chlorosis seems to be overcome by an application of ammonium sulfate and that recovery takes about a year."

Combating raspberry diseases, L. M. Cooley (*N. Y. State Hort. Soc. Proc., 82 (1937), pp. 272–275*).—This is a general discussion of raspberry mosaic virus diseases and their control by use of resistant varieties, based largely on investigations and experiences by the New York State Experiment Station. The Marcy and Indian Summer varieties of red raspberry developed by the station give much promise, and some purple seedlings, as yet unnamed, have passed through 2–3 yr. of heavy exposure to infection.

Isolations made from heart rot of banana in Honduras, O. A. Reinking (*Phytopathology, 27 (1937), No. 8, pp. 853, 854*).—*Fusarium moniliforme subglutinans* is rather widespread in the Tropics on various parts of the banana. In Trinidad it has been isolated from the tip rot of immature Cavendish fruit. In Honduras *F. moniliforme* was isolated by the author from banana. It has

[2] Farming in So. Africa, 10 (1935), No. 113, pp. 333–336, figs. 5.

also been isolated there from corn and has been referred to as the cause of a tip rot of banana fruits in Uganda, Africa. In view of the fact that these two Fusariums have been found associated with or reported as causing similar heart rot diseases of banana and abaca in various parts of the world, it is suggested that further inoculation and culture studies are necessary to clarify the situation.

Experiments on the treatment of mottle-leaf of citrus trees, III, E. R. Parker (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 213–215*).—Continuing these studies by the University of California (E. S. R., 76, p. 497), an exceptional opportunity to obtain data on the zinc responses of trees under different fertilizer programs was given by treating half of each plat in a comprehensive fertilizer trial with oranges (in effect since 1927). Tree-condition surveys were made during late winter of each year. From the results obtained it seems evident that zinc treatments are effective on mottle-leaf under a wide range of fertilizer programs. Improvement in both tree condition and yields after zinc treatments indicates that, at least in general, the fertilizer treatments studied (1 lb. of nitrogen annually per tree, from various sources and with various additions) have not in this trial been capable of promoting normal tree development and yield. Uniform treatment of all plats with zinc is believed justified for promotion of more normal tree behavior in order that the specific effects of the various fertilizers may be more accurately determined.

A strain of Alternaria citri Ellis and Pierce causing a leaf spot of rough lemon in Florida, G. D. Ruehle (*Phytopathology, 27 (1937), No. 8, pp. 863–865, fig. 1*).—In this contribution from the Florida Subtropical Experiment Station, a leaf spot is described as occurring in nurseries in southern Florida. Pure culture inoculations indicated that infection occurs readily on uninjured, young, expanding leaves of *Citrus limonia*. The fungus was indistinguishable morphologically from a culture of *A. citri* isolated from a fruit rot obtained from the Florida Experiment Station. Inoculations made with spores of the fruit-rotting strain, however, gave negative results on rough lemon leaves. The leaf-spotting strain produced a typical *Alternaria* rot when inoculated into surface-sterilized oranges and lemons, but did not sporulate in the decayed fruit tissues. A similar leaf spot has been described by E. M. Doidge as occurring on this host in the Union of South Africa.

Bordeaux mixture applications for citrus scab also reduced the severity of the *Alternaria* leaf spot.

A bacterial disease of Delphinium, F. D. Chester (*Phytopathology 27 (1937), No. 8, pp. 855–858, fig. 1*).—This disease of *D. ajacis* is shown to be due to an organism identified as *Erwinia phytophthora*. A blackening of the top end of the stem and a parenchymatous decay extending into the pith are noted.

The Cephalosporium disease of elms, D. B. Creager (*Arnold Arboretum Contrib. No. 10 (1937), pp. 91, pls. 16, figs. 4*).—Almost coincident with the discovery of the Dutch elm disease in the United States, attention was called to a similar native disease causing hitherto baffling losses in nurseries, plantations, and natural stands. The results of over 3 yr. of study of this *Cephalosporium* disease in field and laboratory are presented in this monograph. It occurs almost throughout the natural range of *Ulmus americana* in the United States and Canada, has been reported several times on *U. fulva* and *U. pumila*, and has been successfully inoculated into *U. japonica* in the laboratory. In addition to the generally recognized symptoms, the author presents a comprehensive account of symptoms as they occur in the field and the discovery of primary leaf lesions and of pycnidium production on a large scale. Extensive inoculations have proved the etiological relation of a fungus

producing two forms of fructifications—one hyphomycetous and the other sphaerioidaceous in type. The spores are essentially "endoconidia." Taxonomically, the most that can be said is that on some media it appears to be a *Cephalosporium*, on others it is more closely related in *Cadophora*, and on still others pycnidia are formed relating it to the Sphaerioidaceae. Several strains are evidently involved, differing in cultural and pathogenic features. The behavior of the fungus under various conditions of medium and environment was studied in detail. The difficulty of obtaining *Cephalosporium* fructifications was obviated by use of a synthetic agar medium lacking sugar.

Entrance of the fungus commonly occurs through wounds. The pycnidia develop abundantly on the killed, overwintered twigs, and their spores are highly important in the spread of the disease by wind, rain, and insects. The course of infection follows the vascular system of the leaf into the stem, and the mycelium subsequently invades the wood parenchyma, rays, pith, cambium, phloem, and all parenchymatous cells of the bark.

Recommendations for control, based on life history studies and specific tests, are listed. These include eradication from moderately infected trees by judicious pruning and spraying infected and neighboring uninfected trees with an insecticide-fungicide. Bordeaux mixture proved toxic to the germinating spores of the fungus. All badly infected trees should be removed.

Crown gall on incense cedar, Libocedrus decurrens, C. O. Smith (*Phytopathology, 27 (1937), No. 8, pp. 844–849, figs. 3*).—*Pseudomonas tumefaciens* [=*Phytomonas tumefaciens*] was isolated from *L. decurrens* by the author in 1916. This study was not published at the time, but subcultures were used by various investigators and their work appears in the literature. The crown gall isolation from *L. decurrens* produced galls on *Cupressus sempervirens*, *L. decurrens*, *Schinus molle*, *Salix* sp., *Prunus persica*, *P. cerasifera*, *Diospyros kaki*, and tomato. Galls were also formed on *L. decurrens* by isolations of this strain from *P. persica* and *Salix* sp. Galls on *L. decurrens* have been found on lawn trees and in nursery seedbeds, where they appear in negligible amounts of a few seedlings to as much as 2.5 percent. They are more abundant on land recently cleared of the native nonconiferous growth. The galls induced by the incense cedar strain are described.

This is a contribution by the California Citrus Experiment Station.

Further notes on the disease of Himalayan pines, J. A. Jump (*Penn. Univ., Morris Arboretum Bul., 1 (1937), No. 7, pp. 97, 98*).—The fungus found most consistently associated with cankers on *Pinus excelsa* and its variety *zebrina* was *Sphaeropsis malorum*. Inoculated two- and three-needle pines showed no signs of infection, but several of the 3-year-old white pines were killed and resinous cankers were formed on others. One of the inoculated apple trees was killed within 3 mo. A study of the annual rings of wood from dead Himalayan pines indicated that the cankers had originated in winters of unusually low temperatures. The data at hand show that *S. malorum* should be regarded as a wound parasite which may become very serious in weakened trees. Local occurrence of affected apple trees may account for the prevalence of the disease on Himalayan pines recently noted in Pennsylvania and New Jersey.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The migrations of animals from sea to land, A. S. Pearse (*Durham, N. C.: Duke Univ. Press, 1936, pp. X+176, figs. 4*).—This work, presented in 5 chapters, includes a bibliography of 43 pages.

Mammals of the Chicago region, T. Gregory (*Chicago Acad. Sci., Program Activ., 7 (1936), No. 2-3, pp. 13-74, figs. 23*).—A systematic summary of information on mammals from the Chicago area of which actual specimens are now in existence is presented, together with a key to the orders, families, genera, and species, a description of the region, etc. A bibliography of three pages and a subject index are included.

Scientific survey of Porto Rico and the Virgin Islands, IX, pts. 1-4 (*New York: N. Y. Acad. Sci., 1925, vol. 9, pt. 1, pp. 96, pls. 15, figs. 28; 1926, pt. 2, pp. 97-241, pls. 39, figs. [59]; 1927, pts. 3, pp. 243-406, pls. 7, figs. 16; 4, pp. 409-598+XIII, pls. 4, figs. 3*).—The Mammals of Porto Rico, Living and Extinct—Chiroptera and Insectivora and Rodentia and Edentata—are dealt with by H. E. Anthony in parts 1 and 2 of the volume; the Birds of Porto Rico and the Virgin Islands—Colymbiformes to Columbiformes and Psittaciformes to Passeriformes, by A. Wetmore in parts 3 and 4.

The birds of Puerto Rico, S. T. Danforth (*Los pájaros de Puerto Rico. New York: Rand McNally & Co., 1936, pp. X+198, pls. [12], [figs. 35]*).—This handbook, consisting of descriptions, notes, and a check list of the 182 forms recognized as occurring in Puerto Rico, many of which are illustrated in colored plates from paintings by F. W. Horne, is based in part upon studies by the author previously noted (E. S. R., 65, p. 243). The reports of Wetmore (E. S. R., 34, p. 849, and also above) are referred to, and a list is given of 9 references to the literature.

Some Montana birds: Their relationship to insects and rodents, H. B. Mills (*Montana Sta. Circ. 151 (1937), pp. 48, figs. 20*).—A practical account is given of the more than 20 predatory birds; the 8 fish-eating and related birds; and common birds sometimes considered harmful, namely the American magpie (*Pica pica hudsonia*) and crow (*Corvus brachyrhynchos*), met with in Montana. The account is accompanied by a list of 30 references to the literature.

The distribution and behavior of the spadefoot toad in Connecticut, S. C. Ball (*Conn. Acad. Arts and Sci. Trans., 32 (1936), pp. 351-379, pls. 2, figs. 2*).—This contribution relates to the spadefoot toad (*Scaphiopus holbrookii holbrookii* (Harlan)), which occurs in the eastern States from Massachusetts to Florida and westward to Louisiana, Texas, and Arkansas.

Myiasis in wild animals in southwestern Texas, A. W. Lindquist (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 735-740, figs. 2*).—The cottontail, jack rabbit, opossum, and white-tailed deer were found to harbor natural infestations of the screwworm in southwestern Texas. It is pointed out that the fact that wildlife serves as a considerable source of infestation of the screwworm makes the control in livestock more difficult. As high as 4 percent of jack rabbits may carry infestations of this screwworm. The predisposing causes which render animals subject to fly attack are rabbit bots (*Cuterebra buccata* F.), gunshot wounds, boils, disease, birth of young, injury by predators, fighting, and brush and wire cuts. Infested wild animals should be treated whenever practicable and maggot-infested carcasses promptly burned. Effective control of screwworms in livestock should result in fewer attacks on wildlife.

Studies of Heterakis gallinae (Gmelin 1790) Freeborn 1923, a nematode parasite of domestic fowls, A. D. Baker (*Roy. Canad. Inst. Trans., 20 (1935), pt. 2, pp. 179-215, figs. 5; 21 (1936), pt. 1, pp. 51-86, pls. 15, figs. 2*).—Following a brief introduction, a historical account, and a consideration of methods of investigation and of the general anatomy, a study of the special anatomy of the cecal worm of fowls (*H. gallinae*) is reported upon at length. A list of 54 references to the literature is included.

Officials and organizations concerned with wildlife protection, 1937, compiled by F. G. Grimes (*U. S. Dept. Agr., Misc. Pub. 276 (1937), pp. 15*).—This, the thirty-seventh annual directory (E. S. R., 76, p. 356), follows the same general form of previous editions, including only those organizations that are national or State-wide in character.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 802–805, fig. 1*).—The notes here presented (E. S. R., 77, p. 812) are as follows: Preference of Corn Earworm Moths for Sweet Corn for Oviposition, by G. W. Barber (pp. 802, 803); Number of Short-Winged Chinch Bugs Produced Under Laboratory Conditions, by R. G. Dahms (pp. 803, 804) (U. S. D. A. Bureau of Entomology and Plant Quarantine and Okla. Experiment Station cooperating); Composition of Paris Greens Manufactured During 1936, by F. E. Dearborn (p. 804); Vegetable Weevil (*Listroderes obliquus* Klug) Feeding Upon Tobacco, by F. S. Chamberlin and A. H. Madden (pp. 804, 805); and Methods of Preserving and Studying Genitalia, by Z. P. Metcalf (p. 805).

[Contributions on extension entomology] (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 705–715*).—Contributions on extension entomology (E. S. R., 76, p. 358) presented at the annual meeting of the American Association of Economic Entomology held at Atlantic City, N. J., in December 1936 are: Value of Coordinating Extension Entomologists and the Bureau in Conducting Insect Control Campaigns, by P. N. Annand (pp. 705–710); A Large-Scale Demonstration in Mosquito Control, by E. N. Cory and S. L. Crosthwait (pp. 711, 712); and Intensive Demonstrations in Cotton Flea Hopper Control, by R. R. Reppert (pp. 712–715).

Common insect pests of New York, P. J. Parrott et al. (*New York State Sta. Circs. 163, 164, 169–173, 176, 177 (1937), pp. 4 each, fig. 1 each*).—In continuation of these practical accounts (E. S. R., 74, p. 288) The Spruce Gall Aphids are dealt with by F. L. Gambrell; The Cabbage Root Maggot, by H. Glasgow; The Codling Moth, by S. W. Harman; The Pear Midge, by F. G. Mundinger; The Asparagus Beetle, by H. C. Huckett; The Peach Borer, by D. M. Daniel; The Japanese Beetle, by H. E. Hodgkiss; The European Corn Borer, by G. E. R. Hervey; and The Elm Leaf Beetle, by F. L. Gambrell. Each contribution includes a colored illustration of the insect and its injury.

[Work in entomology by the Puerto Rico College Station] (*Puerto Rico Col. Sta. Rpt. 1936, pp. 53–64, 120–122*).—The progress of work with the sugarcane root-stalk borer *Diaprepes abbreviatus* L. (E. S. R., 77, p. 814); the polilla or dry-wood termite *Cryptotermes brevis* Walk.; the lima bean pod borer and the Caribbean pod borer; miscible oils for control of scale insects (the white peach scale and *Pseudoparlatoria ostreata* Ckll.) infesting papaya trees; the banana root borer; the sweetpotato weevil; parasites of the coffee leaf miner *Leucoptera coffeella* Guer.; control of the coffee shade tree ant or hormiguilla *Myrmelachista ambigua ramulorum* Wheeler; and the changa, including the introduction of the wasp parasite *Larra americana* Sauss. from Brazil, is reported upon by G. N. Wolcott, and with the corn earworm and other corn insects at the Isabela Substation in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, by L. A. Serrano.

[Contributions on economic insects and their control] (*Wash. State Hort. Assoc. Proc., 30 (1934), pp. 50–64, 66–75, figs. 3; 31 (1935), pp. 96–98, 107–118, 134–159*).—Contributions presented at the 1934 meeting of the association (E. S. R., 71, p. 512) include the following: A Nine Year Study of Codling Moth Trap Records, by R. L. Webster (pp. 50, 51), and Increasing and Maintaining Lead Arsenate Deposits for Codling Moth Control, by J. Marshall, P. M. Eide, and

A. E. Priest (pp. 52–64), both contributed from the Washington Experiment Station; Practical Methods of Orchard Sanitation for the Control of the Codling Moth, by E. J. Newcomer (pp. 66, 67); Report on the Introduction of *Aphelinus mali* Hald., a Parasite of the Woolly Apple Aphid in the Wenatchee, Washington, District, by M. A. Yothers (pp. 68–71); and Possibility of Controlling Codling Moth With Nicotine Vapor, by R. H. Smith (pp. 72–75), contributed from the California Citrus Experiment Station.

Contributions presented at the 1935 meeting include the following: Sulfur Sprays for Mite Control, by C. Miller (pp. 96–98); Lime-Sulphur for Dormant and Mite Control, by A. L. Deaver (pp. 107–109); Sulphur Sprays for Dormant and Mite, by H. S. Doane (pp. 110–113); Oil Sprays, by F. A. Norton (pp. 114–118); How I Controlled Two-Spotted Mite in 1935, by J. C. Childs (pp. 134, 135); Investigations of Baits Attractive to the Codling Moth, by E. R. Van Leeuwen (pp. 136–139); Orchard Sanitation for the Control of the Codling Moth, by E. J. Newcomer (pp. 140, 141); The Present Status of Calcium Arsenate in Codling Moth Control, by J. Marshall and K. Groves (pp. 142–150), and Is Lead Arsenate a Failure? by R. L. Webster (pp. 151–156), both contributed by the Washington Experiment Station; and The Use of Low Viscosity Mineral Oils in Spray Residue Control, by E. Smith, A. L. Ryall, C. W. Murray, and J. Cassidy (pp. 157–159).

Anticipating and controlling insect outbreaks (*Montana Sta. Rpt. 1936, pp. 26–28*).—Brief reference is made to the need of knowledge of environmental factors.

The wheat field survey for 1937, J. S. Houser (*Ohio Sta. Bimo. Bul. 188 (1937), pp. 142–145, figs. 3*).—The annual wheat field survey of Ohio (E. S. R., 76, p. 214) in 1937, conducted in 35 counties, resulted in finding 4.4 percent of the wheat straws infested with theh essian fly as compared with 12.4 percent the preceding year. Evidence was found in a number of fields, particularly in Noble and Washington Counties, of the presence of *Calendra minima*, which, in the larval stage, feeds within the interior of the lower part of the wheat plant after the plant is somewhat mature. One field in Noble County had 8 percent of the straws examined affected.

Control of insect pests of cabbage and broccoli, S. W. Clark (*Tex. Farming and Citric., 13 (1936), No. 4, p. 9*).—A brief note from the Texas Experiment Station.

New York State's nursery industry has major insect problems, F. L. Gambrell (*Farm Res. [New York State Sta.], 4 (1937), No. 1, pp. 5, 7, figs. 3*).—A brief practical account is given of some of the more important pests of nursery stock studied at the station and the control measures applicable.

Some common household insects and their control, N. Turner and B. H. Walden (*Connecticut [New Haven] Sta. Bul. 400 (1937), pp. 833–855, figs. 13*).—A practical summary of information.

[**Contributions on entomological technic**] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1937, ET–94, p. 1, pl. 1; ET–95, p. 1; ET–96, pp. 2, pls. 3; ET–97, pp. 2, pl. 1; ET–98, p. 1, pl. 1; ET–99, p. 1, pl. 1; ET–100, p. 1, pl. 1; ET–101, pp. 2, pl. 1; ET–102, p. 1; ET–103, pp. 3, pls. 4; ET–104, pp. 2, pl. 1; ET–105, p. 1, pls. 2; ET–106, pp. 4, pls. 2; ET–107, pp. 3; ET–108, pp. 3, pls. 2; ET–109, pp. 3; ET–110, p. 1, pl. 1*).—Further contributions (E. S. R., 77, p. 216) are A Cocooning Rack, by R. Cecil (ET–94); A Cell for Rearing Mites, by A. C. Davis (ET–95); An Inexpensive Humidifier Featuring Hygienic Principles, by W. G. Bradley and O. E. Berndt (ET–96); Efficient Humidifiers for Controlled Cabinets, by R. A. Fulton (ET–97); A Small Thermo-regulated Water Bath Heater, by L. H. Davis and E. M. Livingstone (ET–98); Method of Rearing

Microbracon kirkpatricki Wilk. and *Microbracon mellitor* Say [on the Pink Bollworm], by L. W. Noble and W. T. Hunt (ET–99); An Insectary Method of Rearing Hornworm [Tomato Worm] Larvae, by A. H. Madden, A. W. Morrill, Jr., and F. S. Chamberlin (ET–100); An Improved Container for Shipping Adult Parasites [Ichneumonidae, Braconidae, Small Tachinidae], by J. K. Holloway (ET–101); Apparatus for Studying Effect of Submersion on Small Insects, by D. F. Barnes (ET–102); A Mobile Entomological Laboratory, by L. D. Christenson and W. F. Turner (ET–103); A Simple Microprojector, by S. W. Simmons (ET–104); An Apparatus for Dusting Individual Plants, by J. P. Vinzant (ET–105); Methods of Propagating *Ribes* in Nutrient Solution for Use as Test Plants, by H. R. Offord, G. R. Van Atta, and C. R. Quick (ET–106); Stickers for Derris on Cabbage and Beans, by R. A. Fulton (ET–107); A Shaker and Modified Berlese Funnel for Extracting Alfalfa Weevils [the Alfalfa Weevil] From Baled Hay, by R. W. Bunn and W. C. McDuffie (ET–108); Methods for the Fixing and Preservation, for Exhibit Purposes, of the Natural Green Color of Pea Plants and Pods, by F. E. Carroll (ET–109); and An Inexpensive Fire Extinguisher, by J. R. Douglass (ET–110).

A laboratory method of comparing insecticides, J. B. Moore (*Farm Res. [New York State Sta.], 4 (1937), No. 1, p. 7, fig. 1*).—A brief description, with an illustration, is given of a method of injecting insecticides directly into the alimentary canal of the codling moth by the use of a hypodermic syringe which has been altered to permit administration of dosages as small as 0.001 cc. The operation is carried out under a binocular microscope to facilitate making the injection and to avoid injuring the caterpillar.

The composition of some commercial insecticides, fungicides, bactericides, rodenticides, and weed killers, compiled by H. J. Fisher and E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 398 (1937), pp. 513–750*).—This is a compilation which supersedes Bulletins 300 and 346 (E. S. R., 69, p. 234).

Occurrence of l-nornicotine in Nicotiana sylvestris, C. R. Smith (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 724–727*).—In a study of *N. sylvestris* the alkaloids were found to be *l*-nornicotine and *l*-nicotine. The total alkaloidal content was approximately 1 percent, of which *l*-nornicotine represented about 95 percent and *l*-nicotine about 5 percent. Anabasine could not be detected in the small quantity of alkaloids available. A description is given of the extraction of the alkaloids and the separation of nornicotine from nicotine and tests for purity.

New spray combinations and how they work, J. Marshall and K. Groves (*Wash. State Hort. Assoc. Proc., 32 (1936), pp. 122–126, fig. 1*).—A practical contribution from the Washington Experiment Station based upon studies previously noted (E. S. R., 77, pp. 658, 660).

The effect of petroleum-oil sprays on insects and plants, M. D. Farrar (*Ill. Nat. Hist. Survey Bul., 21 (1936), Art. 1, pp. VI+32, figs. 22*).—This paper brings together data from the 8 yr. of investigation, 1925–33, conducted through a research fellowship, and includes the data that appear to illustrate progress in the knowledge of oil sprays. The properties of oil emulsions, the effect of petroleum oils on plants, the results of insecticide tests with the emulsions, and the use of oils with fungicides are dealt with. As tangible results of the investigation, a miscible oil and a white-oil stock emulsion have been developed. The author finds that "the use of oil emulsions for codling moth control in late-brood sprays, particularly when mixed with nicotine sulfate, is very promising. Sprays of oil emulsions for late-brood codling moth larvae have given excellent results in the reduction of lead arsenate residues. The larvicidal limits of oil emulsions are fairly well established. The use of oil emulsions with lead arsenate sprays

shows promise in the control of codling moth larvae. The use of petroleum oil as a carrier for plant poisons is recognized. Oil emulsions are giving a control of scale insects superior to all other sprays for scale." The contribution is presented with a four-page list of references to the literature.

Tests of insecticides for cotton boll weevil and bollworm control, using the Latin square plat arrangement, and analysis of variance, J. C. GAINES (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 785–790, fig. 1*).—In work at the Texas Experiment Station the Latin square block arrangement, using $\frac{1}{20}$-acre blocks, was found applicable for use in tests for bollweevil and bollworm control. "By this method of block arrangement with the replications, the variation due to heterogeneous soil and uneven distribution of insects was eliminated, thus increasing the value of the experiment. The analysis of variance eliminated much guesswork in the interpretation of the data. In these tests calcium arsenate, calcium arsenate-sulfur 50:50, calcium arsenate plus 5 percent paris green, and calcium arsenate plus 25 percent lime were equally effective in controlling the bollweevil. The addition of sulfur, paris green, or lime did not affect the toxicity of the calcium arsenate to the weevil, but when the dosage of calcium arsenate was reduced 25 percent by the addition of lime the toxicity to the bollworm was reduced. Sulfur, paris green, or lime did not prevent the increases of aphids that occurred on all the blocks. The various insecticides were equally effective in controlling the bollweevil, but an average difference of 3.8 percent increase in bollworm injury resulted from treatment C [calcium arsenate plus 25 percent lime]. This difference, with the average difference in yield of 6.3 lb. of seed cotton that was obtained, indicates that an average of 1 percent injury during the time in which two broods of worms occurred reduced the yield on the plats about 1.7 lb. of seed cotton, or 34 lb. per acre."

Deposition and retention of sprays on apples, D. E. H. FREAR and H. N. WORTHLEY (*Pennsylvania Sta. Bul. 344 (1937), pp. 32, figs. 9*).—In the investigation reported the deposition and retention of lead and arsenic trioxide were determined by analyzing samples of fruit and foliage taken from apple trees before and after each cover spray application and at harvest.

"In 1934 17-year-old Stayman and York Imperial trees were sprayed 6 times, the applications averaging 12 gal. per tree at 400-lb. pressure. The 3 spray mixtures [A, B, and C] contained lead arsenate at 3 lb. per 100 gal. Mixtures A and B also contained 2 gal. of liquid lime-sulfur, mixture B 2 lb. of skim milk powder, and mixture C 5 lb. of dry flotation sulfur and 1 qt. of menhaden fish oil. Samples of foliage and fruits were taken from the lower branches. Spray deposits were greater on Stayman than on York Imperial, but losses between spray applications were greater from Stayman. The weathering away of spray deposits was a negligible factor compared with losses per unit area of fruit surface due to growth. The foliage was practically full-grown by the second cover spray, but the fruits had reached only about 7 percent of their final area at the third cover spray, and 12 percent at the sixth cover spray. On the foliage, mixture C gave the greatest spray deposits and the smallest losses between spraying dates. After the sixth cover spray, leaves in this treatment showed 470 mg of lead and 280 mg of arsenic trioxide per square meter, or increases of 4 and 5 times, respectively, over the amounts found after the first cover spray. On the fruits, mixture A gave the greatest deposits of lead and arsenic trioxide, but mixture C gave the smallest losses between spraying dates. After the sixth cover spray the greatest deposits were 350 mg of lead and 140 mg of arsenic trioxide per square meter, increases of less than 1½ times the amounts present after the first cover spray. Subsequent to the last cover spray residues were retained best from mixture C. By harvest, lead residues on the fruits were

from 1/6 to 1/12 of those on the foliage, and arsenic residues 1/10 to 1/16, due to expansion of the fruit surfaces. The fruits retained lead in greater proportion than the foliage.

"In 1935, mixture C was applied to Stayman in three different cover spray schedules, and fruit samples were taken from both upper and lower branches Top fruits grew more rapidly and showed larger losses of spray deposit per unit area than fruits on the lower branches. Uniform spacing of spray applications at 14-day intervals, and with intervening 7-day sprays to the tops alone, showed either that early season coverage was poor, particularly in the tops, or that spray deposits became excessively heavy in the later sprays.

"The experimental evidence suggests the need for testing, under conditions of heavy codling moth attack, a schedule of 5 cover sprays spaced at intervals of 5, 9, 13, and 17 days, the last application to be made to the tops only. Recommendations must await the results of this test."

Tests on comparative effectiveness of grasshopper baits, F. E. Whitehead, R. R. Walton, and F. A. Fenton (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 764–768, fig. 1*).—The results of comparative tests of the effectiveness of grasshopper baits in Oklahoma, where the differential grasshopper, the two-striped grasshopper, and *Melanoplus mexicanus* were the predominating species, and the costs of such baits, are reported in detail in table form.

The standard mixture consisting of bran 100 lb., molasses 2 gal., amyl acetate 3 oz., sodium arsenite 2 qt., and water 10–12 gal. gave the best kill (100 percent), but the efficiency of the straight bran mixture consisting of bran 100 lb., sodium arsenite 2 qt., and water 10–12 gal. was nearly its equal (98.6 percent). The effectiveness of the straight sawdust bait was low (67.6 percent), but its economy makes it attractive in many cases.

The 1936 grasshopper outbreak in Oklahoma, C. F. Stiles, E. E. Scholl, and F. A. Fenton (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 768–771*).—An outbreak of grasshoppers in Oklahoma in 1936, in which the entire State was involved, and the campaign for control are reported upon. There were at least four species which caused most of the trouble, namely, the differential grasshopper, *Melanoplus mexicanus*, the two-striped grasshopper, and *Dissosteira longipennis*.

Biology of the bordered mantid Stagmomantis limbata Hahn (Orthoptera, Mantidae), R. A. Roberts (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 96–109, pl. 1*).—Observations of *S. limbata*, found only in Mexico, Arizona, New Mexico, and Texas, and of which a single generation occurs each year, are reported upon. The parasites *Eupelmus brevicauda* Cwfd., *Podagrion mantis* Ashm., and *P. crassiclava* Gahan were reared from the egg masses collected in Arizona. The nymphs were fed *Drosophila* sp., the horn fly, and the housefly. The adults were given the secondary screwworm, the housefly, and *Sarcophaga* spp.

Biology of the minor mantid Litaneutria minor Scudder (Orthoptera, Mantidae), R. A. Roberts (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 111–121, pls. 2*).—A report of observations made at Uvalde, Tex., from 1928 to 1934 of a small mantid species found in the western part of the United States and Mexico.

Experiments to control sugar beet leafhopper, 1936, L. W. Campbell (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 687, 688*).—The improvement of spray materials and machines during the last 5 yr. has been such that by 1936 atomized toxic spray oils gave almost perfect control of the beet leafhopper on 450 acres of sugar beets at different stages of development. Two types of materials were applied by airplane in the first demonstration: (1) An oil-

kerosene-pyrethrum mixture consisting of a kerosene-type oil blended with an oil having a viscosity of approximately 60 sec. to make an ultimate product of 34 sec. viscosity, Saybolt Universal, and containing 4 percent of a 20:1 pyrethrum extract; (2) an oil having a viscosity of approximately 38 sec. Saybolt Universal containing 4 percent of a 20:1 pyrethrum extract. The decrease as determined 24 and 72 hr. following application was 87.8 percent of the beet leafhoppers. In the second demonstration, 5 gal. per acre of beet leafhopper spray having a viscosity of 36 sec. and a pyrethrum content of 4 percent of a 20:1 pyrethrum extract applied by airplane on April 30, at a prevailing temperature of 84° F. and an average infestation of 4.3 hoppers per beet, gave a control of 97.6 percent, the counts having been made 24 hr. later. In duplicate tests, using a ground vaporizing machine, the control was 98.2 percent.

Leafhopper injury to potato foliage and its relation to tuber yields, H. Menusan, Jr. (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 772–777, figs. 3*).—In experiments conducted on mineral upland soils in western New York the Smooth Rural variety of potatoes was grown in large field cages with and without the potato leafhopper. "In the absence of leafhoppers sulfur dust and bordeaux spray applied to the foliage failed to give increases in tuber yields over untreated plants. In the presence of leafhoppers, however, both treatments reduced leafhopper populations and resulted in increases in yields over the untreated plants. Treated plants in uninfested cages always produced larger tuber yields than plants receiving the same treatments in leafhopper-infested cages. Leafhopper foliage injury was directly correlated with a decrease in numbers and size of the resultant tubers. Bordeaux spray applied to the upper side only of potato leaves was but slightly toxic to nymphs and did not repel potato leafhoppers. When the spray was applied to the underside or both sides of leaves it was both highly toxic and repellent to the nymphs, and it also repelled the leafhopper adults."

Aphis transmittal of Commelina nudiflora Linnaeus mosaic to pineapple, W. Carter (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 155–161, pls. 2*).—At the [Hawaiian] Pineapple Producers' Experiment Station three species, the melon aphid, green peach aphid, and potato aphid, have been shown to transmit the virus of *C. nudiflora* mosaic to pineapple plants. The percentage of infection obtained under laboratory conditions decreased as the pineapples used became older and the tissues more resistant to penetration by aphids. The disease is not known to exist in commercial pineapple fields.

The seasonal cycle of Phylloxera notabilis Pergande (Phylloxeridae, Homoptera), F. E. Whitehead and O. Eastep (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 71–74, fig. 1*).—The authors report observations of *P. notabilis*, for which the name "pecan leaf phylloxera" is proposed, since it is the most common form on pecans, its only host, and present throughout most if not all of the pecan belt. It appears to be of limited economic importance.

A new Japanese Prociphilus (Aphidae), A. C. Maxson and G. F. Knowlton (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 24, 25, fig. 1*).—An apparently undescribed aphid of the genus *Prociphilus* on pear from Japan is described as new in this contribution from the Utah Experiment Station.

Feeding predetermined doses of poison to silkworms, J. W. Bulger (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 689–693, figs. 3*).—A method for administering predetermined doses of powdered insecticides to the silkworm is described. The name inlay sandwich method is given to this modification of the leaf sandwich method.

Experiments to control pecan nut casebearer in Texas, 1936, C. B. NICKELS (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 761–763*).—In control work with the pecan nut casebearer conducted in two localities in the semiarid central and southwestern portions of Texas, properly timed single spray applications of lead arsenate and of nicotine combinations resulted in good control of the larvae of the first generation. "Two applications of those insecticides effected nearly perfect control of this insect. Under semiarid conditions no injury to pecan foliage resulted from the application of the insecticides discussed in this paper. A record of the hatching of first-generation eggs collected in the orchard at approximately biweekly intervals afforded a basis for accurately determining the dates for spray applications."

Oblique-banded leaf roller, a dewberry pest in Utah, G. F. KNOWLTON and M. W. ALLEN (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 780–785, fig. 1*).—The tiny lepidopterous caterpillar which has infested both ripe and green dewberry fruits in several northern Utah localities since 1929 has been identified by the Utah Experiment Station as the oblique-banded leaf roller. The eggs were laid in masses upon the upper side of leaves during late June and the first half of July. "The larvae from these eggs remained small, feeding upon dewberries and dewberry leaves until the cool temperatures of fall caused them to spin their hibernacula in protected places. Within this silken retreat the winters were passed. Larvae emerged in spring in time to tie and web young developing dewberry leaflets. Growth was rapid during the spring, the larvae reaching a length of 18 to 28 mm before maturity was reached. Pupation occurred from June 11 to July 1 during 1936, with adult emergence in cages occurring from June 19 to July 7. Reared parasites included four species of Hymenoptera and one of Diptera. In at least one case, a spider was observed to attack a leaf roller larva."

Number of instars of the pink bollworm collected in squares and in bolls of cotton, L. C. FIFE (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 57–63, figs. 2*).—Observations of the instars of the pink bollworm and their duration through periodic examination of artificially infested squares for exuviae are reported.

Analysis of attrahent factors in fermenting baits used for codling moth, J. R. EYER, J. T. MEDLER, and H. L. LINTON (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 750–756, figs. 2*).—Laboratory tests of the effectiveness of compounds synthetized from various alcohols and acids at the New Mexico Experiment Station, made by use of an insect olfactometer especially adapted for the adult codling moth, are reported upon, but conclusions cannot as yet be drawn. The apparatus and methods employed are described. As to the bacterial flora related to fermentation in codling moth baits, preliminary tests are said to indicate that cane sugar solutions fermented through the action of pure cultures of most of the high acid- and gas-producing types of bacteria are more attractive to the codling moth than the same baits allowed to ferment through contamination by a mixed flora from the air.

Inverted spray mixtures and their development with reference to codling moth control, J. MARSHALL (*Washington Sta. Bul. 350 (1937), pp. 88, figs. 13*).—Laboratory investigations with inverted lead arsenate and inverted calcium arsenate mixtures, comparative larvicidal values of partially inverted calcium arsenate and lead arsenate mixtures, and some physical characteristics of oil-arsenical spray mixtures and deposits are reported upon at length, followed by the results of field investigations of lead arsenate, calcium arsenate, and zinc arsenite mixtures.

An inverted spray mixture is described as one in which a suspended solid initially wetted by water becomes wetted by oil prior to, or at the moment of, impact upon a sprayed surface. "Inversion of arsenical spray mixtures requires the addition of some substance promoting oil-wetting of the arsenical, which is nominally preferentially wetted by water. This substance may be a fatty acid such as oleic acid, a univalent, divalent, or trivalent soap, or other fatty acid compounds such as diglycol oleate. When univalent soaps or free fatty acids produce inversion, it is believed that oil-wetting is due largely to the formation of oil soluble, or preferentially oil wettable, divalent or trivalent soap. Inverted spray mixtures have the capacity to cause a remarkable increase in solid deposit as spraying is prolonged upon one point. This characteristic appears to depend on the solid particles being coated by a film of oil, yet not loosely dispersed in it. Uniformly filmed deposits are typical of these spray combinations, but this effect is one of wetting and adhesion. Spreading does not appear to be a factor. Inverted mixtures have been made for codling moth control, with lead acid arsenate, synthetic cryolite, natural cryolite, commercial 'tricalcium' arsenate, or zinc arsenite as the solid. . . . Inversion may be strongly influenced by impurities in the solid insecticide, oil, water, or oleic acid. The introduction of fungicides would represent a problem for additional investigation.

"Hydrophilic colloids, such as ammonium caseinate, exert a strong stabilizing effect upon inverted mixtures. Zinc sulfate in amounts of . . . 2 oz. or more per 3 lb. of arsenical has also been found to have a stabilizing effect upon lead arsenate mixtures. Larger amounts have been required to stabilize calcium arsenate mixtures. The salts of divalent or trivalent metals cause inversion of oil-in-water to water-in-oil emulsions when the former are stabilized by univalent soap. They also promote oil-wetting of arsenical particles when these are present in such a system. Sometimes the inverted type of lead arsenate mixture is too stable. In such cases electrolytes such as zinc sulfate in amounts of . . . 0.25 to 0.5 oz. for 3 lb. of lead arsenate are suggested for destabilization, i. e., promotion of oil-wetting of the lead arsenate. An increase in soap content or the introduction of free fatty acid may serve the same purpose. Inversion is influenced both by agitation in the spray tank and by passage of the mixture through the release valve of the pump. . . . The ovicidal effect of inverted mixtures appears to be slightly less than that of noninverted mixtures. . . .

"Aside from ovicidal effect, oily arsenical deposits have been found more effective in preventing the establishment of codling moth larvae than nonoily deposits of equal type and amount. In the main, this effect may be due to the greater difficulty experienced by larvae in attaching their silken threads to an oily surface, as well as from the greater likelihood of their picking up oily arsenical particles than nonoily particles. Though moderate applications of inverted spray mixtures have given heavier deposits and better codling moth control than moderate applications of noninverted mixtures containing the same amount of oil, their outstanding superiority becomes evident only with heavy application. With the noninverted mixture once the fruit has been wetted with water no more suspended solids can be made to adhere, while with the inverted mixture the oil and solid constituents remain upon the fruit while the water drips to the ground.

"Inverted arsenical mixtures made with the ordinary type of highly refined, light to medium summer petroleum oil tend to form relatively large agglomerates of the solid particles on the fruit surface. These agglomerates, particularly in the case of calcium arsenate, may be so large as to prohibit their

ingestion by the newly hatched codling moth larva. The size of the agglomerates depends to a considerable extent upon the type of oil that is used, as well as [upon] the ratio of oil to solid. Fissuring and weathering of arsenical deposits is less evident when oil is present than when not present. This applies especially to inverted mixtures, and seems to be caused by the oil softening the apple cutin. Kerosene has apparently no influence upon fissuring of deposit. . . .

"Inverted spray mixtures have been made with various grades of summer petroleum oil, as well as with herring oil, kerosene, and herring oil-kerosene mixtures. When it has been necessary to avoid the use of petroleum oil, a mixture consisting of 25 percent herring oil and 75 percent kerosene has produced satisfactory inversion, an oily deposit, and good codling moth control. However, such a mixture has for practical purposes no ovicidal effect. Approximately 0.5 percent of oil and 0.25 lb. of univalent soap have been necessary for the inversion of 3 lb. of lead arsenate in 100 gal. of water. The amount of soap required for calcium arsenate has been variable. The most satisfactory soaps for these spray combinations have been the oleates of triethanolamine or ammonia.

"In a district in which from 2 to 4 second-brood applications are the rule, satisfactory control of even the heaviest of codling moth infestations has been accomplished entirely by early season applications of inverted lead arsenate mixtures. Four inverted lead arsenate applications containing 0.5 percent summer petroleum oil, applied during May and June, have not caused obviously deleterious effects to fruit or foliage of the apple under the arid conditions of the Wenatchee Valley.

"Residue removal is complicated by the presence of petroleum oil in inverted mixtures and by the fact that they result in very high arsenical deposits if heavily applied. Such mixtures containing petroleum oil should not be used later than July 1. If applied in May and June, however, they have not caused unusual difficulties in residue removal. The cost of controlling very severe codling moth infestations with inverted mixtures should be less than that of any other type of spray mixture at present commercially available. They have been both more effective and more efficient than noninverted mixtures. Commercial tricalcium arsenate has been used in the form of an inverted mixture by the addition of a small but variable amount of zinc sulfate, as well as univalent soap and summer petroleum oil. This combination appears promising as a means of eliminating lead from apple sprays."

A three-page list of references to the literature is included, as are four appendixes which present (1) a table of areas of apple disks for deposit analysis, (2) procedure in preparing analytical samples and determination of arsenic, (3) the variation in deposit of lead arsenate used alone in water, and (4) analyses of materials.

The relation of codling moth to temperature and rainfall, R. L. Webster (*Wash. State Hort. Assoc. Proc., 32 (1936), pp. 133–141, figs. 5*).—This contribution (E. S. R., 74, p. 228) includes charts graphically illustrating the data presented.

Tests on baits for oriental fruit moths, 1936, S. W. Frost (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 693–695*).—The chemotropic responses of the oriental fruit moth to 40 chemicals tested as attractants are reported upon in table form in this contribution from the Pennsylvania Experiment Station. The 10 leading materials for the year, in the order of their attractiveness, were oleic acid, U. S. P.; terpinyl acetate; safrole; eugenol; oleic acid, linolic free; oleic acid, commercial; tartaric acid; linolic acid; sodium oleate; and acetone.

U. S. P. During the preceding year acetic acid, anethole, anisic aldehyde, and linseed oil were among the 10 best materials, but in 1936 all but acetic acid were far down the list of those tested. Certain materials were found to be more attractive at one season of the year than another; thus, terpinyl acetate exceeded the catch of any other material during May and June, but the catches during the remainder of the summer were below the average. The acids and sodium oleate were more attractive during August, September, and October, although tartaric acid was an exception. Terpinyl acetate, oleic acid, and safrole have for years been the leading attractants. Most of the materials were inexpensive, costing less than 1 ct. a trap. Linolic acid, while very attractive, is too expensive for practical use.

Experiments on breeding corn resistant to the European corn borer, M. T. MEYERS, L. L. HUBER, C. R. NEISWANDER, F. D. RICHEY, and G. H. STRINGFIELD (*U. S. Dept. Agr., Tech. Bul. 583* (*1937*), *pp. 36, fig. 1*).—Experiments conducted by the U. S. D. A. Bureau of Plant Industry in cooperation with the Ohio Experiment Station and State University from 1926 to 1932, inclusive, mostly in northern Ohio, with strains of corn suitable for growing under conditions of infestation by the European corn borer, in which natural infestation was relied upon, are reported upon, the details being given in 16 tables and 1 graph.

"Adapted hybrids of inbred lines were used mostly, although adapted open-pollinated varietes, inbred lines as such, exotic strains, and strains having unusual plant characters were also studied. Infestation was very light on strains of low vigor. As a consequence it was necessary to rely upon the hybrids of inbred lines rather than upon the lines themselves in classifying them as to degree of susceptibility. None of the exotic or unusual strains showed marked resistance. The percentage of larvae surviving from eggs to maturity was lower as strains were later and likewise lower as planting dates were delayed. Egg deposition was less as strains were shorter in growth at the time of moth flight. Earlier strains tended to be taller at this stage. The expected infestation for each strain was computed from the multiple regression of infestation on strain height at the time of oviposition and strain silking date. A significant difference in infestation among strains remained after correction to the expected, and the writers accept only this residuum of difference as usable in classifying strains into 'susceptible' and 'resistant' groups. Significant differences in the degree of infestation among the hybrids of inbred strains and between certain of these hybrids and locally adapted open-pollinated varieties extended from season to season. In these experiments considerably less than 100 percent of the stalks were infested in any season. Under such conditions it should be possible to produce agronomically satisfactory hybrids that will have only about 80 percent as many borers as adapted open-pollinated varieties of similar growth rate and seasonal requirements. These hybrids are 10 to 20 percent more productive than the open-pollinated varieties, and at the present low levels of infestation high productivity is the most important item in combating the corn borer. Apart from the inherently greater productiveness, their corn borer resistance will be of economic importance if infestation becomes considerably higher and if they maintain their relative resistance under the heavier infestation. Neither the time of tassel emergence, relative to the time of silking, nor the quantity of tassel tissue showed important relations with borer accumulation. The number of leaves in the roll at oviposition showed a low net correlation with percentage of infested plants. Whether the effect was through difference in moth attractiveness or in larval survival was not

determined. Nothing suggestive of immunity nor of a genetically simple resistance was found."

A list is given of 23 references to the literature.

Life history notes on Eriopyga incincta (Morr.) in Kansas, H. H. Walkden (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 695–699, fig. 1*).—A summary is given of observations of the biology of *E. incincta*, one of the many species of cutworms which attack cereal and forage crops in the Middle West but only occasionally occur in sufficient abundance to cause noticeable damage.

Mosquitoes of southeastern Arkansas, W. R. Horsfall (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 743–748*).—A report is made of the collection of 29 species of mosquitoes in southeastern Arkansas, 14 of which are of economic importance. Adults were found to occur every month of the year, but none of economic importance was active during January and February.

The pear midge: Orchard studies and experiments for its control, F. G. Mundinger and F. Z. Hartzell (*New York State Sta. Tech. Bul. 247 (1937), pp. 75, figs. 36*).—A detailed account is given of field tests conducted during 11 seasons for the control of the pear midge, together with information on the habits and seasonal history of this insect in relation to control measures. The critical period was determined by observation of the activities of the insect in relation to bud development and also by a progressive series of treatments with spray mixtures. This period is defined as that time when the most advanced blossom buds in the warmest portion of the orchard begin to show a trace of the pink of the petals between the separating sepals.

"The most definite and practical control was secured by spraying at the critical period with mixtures containing nicotine or with summer oil emulsion without nicotine, although a thiocyanate (lethane) used in 1936 appeared to be a promising material. Nicotine sulfate at the rate of from 0.75 to 1 pt. in 100 gal. of spray mixture was used with one of the following materials: Lime-sulfur, bordeaux, soap, or summer oil. Summer oil emulsion without nicotine was used at the rate of 1.7 to 2 gal. of actual oil in 100 gal. of spray mixture. During some seasons a single application of the more effective mixtures gave commercial control, but during seasons when the midge activity was prolonged and blossom bud development was delayed two applications were necessary for the highest efficiency."

Directions for treatment are given, and a list of 32 references to the literature cited is included.

Aquatic Diptera.—Part III, Chironomidae: Subfamilies Tanypodinae, Diamesinae, and Orthocladiinae, O. A. Johannsen (*[New York] Cornell Sta. Mem. 205 (1937), pp. 84, pls. 18*).—In this further contribution (E. S. R., 74, p. 72) keys to the larvae and pupae of subfamilies of the Chironomidae are followed by descriptions with keys for the separation of larvae and pupae of aquatic species of the subfamilies of Tanypodinae, Diamesinae, and Orthocladiinae. A four-page list of references to the literature is included.

Relation of time of day, temperature, and evaporation to attractiveness of fermenting sugar solution to Mexican fruitfly, M. McPhail (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 793–799, figs. 2*).—A study made of the relation of temperature, time of day, and evaporation rate to the attractiveness of fermenting sugar solution to the Mexican fruitfly in the field at Cuernavaca, Morelos, Mexico, is reported.

Flight tests on screwworm flies, H. E. Parish (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 740–743*).—In tests conducted at Menard, Tex., adults of the screwworm were found capable of flying 9 miles. Necrotic wounds in yearling steers

infested with the larvae were more attractive to liberated screwworms than were meat-baited fly traps.

Relative importance and seasonal activity of Cochliomyia americana C. & P. and other wound-infesting blowflies, Valdosta, Ga., 1935–1936, E. F. KNIPLING and B. V. TRAVIS (*Jour. Econ. Ent.*, *30* (*1937*), *No. 5, pp. 727–735, fig. 1*).—In studies conducted at Valdosta, Ga., the screwworm (*C. americana*) was found to be the most important species causing wound myiasis of animals. Wounds around which the wool had been clipped on the shoulders of sheep were the most attractive to the screwworm, and unclipped shoulder wounds of goats were second in attractiveness. Unclipped shoulder wounds of sheep were the least attractive, but this type of wound was the most attractive to the secondary screwworm.

In the types of wounds studied, the height of attractiveness for the screwworm is reached on about the fifth to the seventh day. The screwworm appeared to be as active on days when the maximum air temperature reached 75° F. as on days when the temperature was 80°, but activity is greatly decreased when air temperatures fall below 70°. A minimum temperature of 24° apparently did not kill adults in nature.

The secondary screwworm, *Phormia* spp., *Lucilia* spp., and *Sarcophaga* spp. were the only other flies found to initiate infestations of wounds. Sheep were more susceptible to infestations by secondary blowflies than were goats or calves. A study of the seasonal activity of the various species of secondary blowflies showed that the secondary screwworm caused more infestations during the period from August to October, whereas *Phormia* spp. predominated from November to March and *Lucilia* spp. from April to July.

Flat-headed apple tree borer in Oklahoma, F. A. FENTON and J. M. MAXWELL (*Jour. Econ. Ent.*, *30* (*1937*), *No. 5, pp. 748–750, fig. 1*).—A brief account is given of observations of the flatheaded apple tree borer. This is one of the most important shade- and fruit-tree insect pests in Oklahoma, being especially injurious to recently transplanted elms and apple and pecan trees. In recent years it has caused considerable injury to rose bushes and has killed many large-sized elms throughout the State.

Life-history studies of the squash beetle in Alabama, L. W. BRANNON (*Ann. Ent. Soc. Amer.*, *30* (*1937*), *No. 1, pp. 43–51, pl. 1*).—This contribution considers the distribution, injury, life history and development, longevity, habits, food plants, and hibernation of the squash beetle, particularly as observed in Alabama.

Control of tobacco flea beetle in plant beds, H. H. JEWETT (*Jour. Econ. Ent.*, *30* (*1937*), *No. 5, pp. 790–793*).—In work with the tobacco flea beetle in plant beds at the Kentucky Experiment Station, a board frame with a tight covering of tobacco cloth gave a much greater degree of protection than any insecticide. The barium fluosilicate mixture appeared to give significantly better control than any of the other insecticides tested.

Boll weevil control, compiled by C. F. CLARK (*Mississippi Sta. Bul. 319* (*1937*), *pp. 32*).—The results of a series of experiments on bollweevil control, conducted in Oklahoma in several localities and each year on different fields, by the U. S. D. A. Bureau of Entomology and Plant Quarantine and the Oklahoma Experiment Station cooperating, are reported upon for 1928, 1931, 1932, and 1933, the details being given in table form. With each experiment is reported the date on which infestation counts were made, the percentage of weevil infestation on that date, the date on which poison applications were made, and the number of squares and bolls per stalk on or near the dates on which the infestation counts were made. No conclusions are drawn.

The alfalfa snout beetle, P. N. Annand (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 715–721*).—A summary is given of the life history and control of the alfalfa snout beetle in New York, based largely on information furnished by the State agencies, including [New York] Cornell Experiment Station Bulletin 629 previously noted (E. S. R., 74, p. 74).

Improved apparatus for inseminating queen bees by the Watson method, W. J. Nolan (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 700–705, figs. 2*).—A description and illustrations are given of an improved apparatus developed by the U. S. D. A. Bureau of Entomology and Plant Quarantine during the course of work with the method devised by Watson (E. S. R., 58, pp. 62, 165). This work is said to have demonstrated that the Watson method can be utilized in conducting genetical studies on the honeybee, seven successive generations having been reared in three seasons from queens inseminated in this way.

Package bees in Manitoba: Eleven years' experimental results, 1921–1931, E. Braun (*Canada Dept. Agr. Pub. 522 (1936), pp. 18, figs. 4*).—A report is made of bee work at the Dominion Experimental Farm at Brandon, Manitoba.

Studies in the Tiphiidae (Hymenoptera, Aculeata).—I, A review of the genera of Myzininae, K. V. Krombein (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 26–30*).—This contribution presents a review of the genotypes of the myzinine genera and a tentative key to the genera of the world.

Biology of the ichneumonid Spilocryptus extrematis Cresson (Hymenoptera), F. L. Marsh (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 40–42*).—*S. extrematis* was the principal primary parasite reared by the author from 3,000 cecropian cocoons collected in the Chicago area, 22.8 percent being parasitized by it. Notes on emergence, breeding habits, and oviposition, the egg and larva, cocoon spinning and pupation, etc., are included.

New hymenopterous parasites of ants (Chalcidoidea: Eucharidae), G. C. and E. W. Wheeler (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 163–175, pls. 2*).—*Orasema sixaolae*, from a nest of *Solenopsis* (*Diplorhoptrum*) *tenuis*, and *O. costaricensis*, from a nest of *Pheidole flavens* Roger, both from Costa Rica, are described as new. A discussion of host relations and a list of the host records of Eucharidae, together with a list of 24 references to the literature cited, are included.

Introduction of Thripoctenus brui Vuillet, parasite of Thrips tabaci Lind., from Japan to Hawaii, K. Sakimura (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 799–802, fig. 1*).—Contributing from the [Hawaiian] Pineapple Producers' Station, the successful introduction of the onion thrips parasite *T. brui* from Japan to Hawaii during the seasons of 1933 and 1934, when approximately 44,000 adults arrived in good condition, is reported. "Shipment of parasite pupal forms was not successful, it being necessary to ship parasitized host larvae. Specially constructed wardian cages for carrying the parasitized host larvae on favored host plants were found quite satisfactory, and for interisland shipping a suitable cage was devised which permitted the sending of a host parasite colony established on a favorable host plant for the insect host."

The biology of Oöencyrtus johnsoni (Howard) and the role of the egg shell in the respiration of certain encyrtid larvae (Hymenoptera), J. D. Maple (*Ann. Ent. Soc. Amer., 30 (1937), No. 1, pp. 123–154, figs. 9*).—Observations of the biology of *O. johnsoni*, an endophagous parasite of the eggs of the harlequin bug, made during the course of an investigation of the eggs and first instar larvae of several species of California Encyrtidae by the California Citrus Experiment Station, are reported upon. A list of 25 references to the literature is included.

Pseudococcobius terryi Fullaway: A Hawaiian parasite of gray sugarcane mealybug in the United States, E. K. BYNUM (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 756–761*).—The sugarcane mealybug parasite *P. terryi*, found by Terry in 1908 parasitizing the gray sugarcane mealybug *Pseudococcus boninsis* Kuwana on one of the Hawaiian Islands, was introduced in 1932 to combat this species in the United States and colonized in Louisiana, Georgia, and Florida the first season. The colonies appear to have become well established in all three States, since recoveries have been easily made several times. In addition to these liberations, the parasite has also been distributed by the movement of seed cane. Although it is very difficult to estimate how effective the parasite is in the control of this sugarcane mealybug, it is deemed undoubtedly of some value.

The black wheat-stem sawfly, J. S. HOUSER (*Ohio Sta. Bimo. Bul. 188 (1937), pp. 145, 146, fig. 1*).—The outstanding revelation of the survey of the black wheat-stem sawfly (E. S. R., 76, p. 226) in 1937 was that in addition to the 19 counties and parts of counties of the State in which it was known to occur in 1936 all of 3 and parts of 8 additional counties had become infested.

ANIMAL PRODUCTION

Animal nutrition, L. A. MAYNARD (*New York and London: McGraw-Hill Book Co., 1937, pp. XIV+483, figs. 36*).—This book deals with the principles of nutrition and their applications in feeding practice and is intended primarily as a text for college students. Successive chapters deal with the expanding field of nutrition, the animal body and its food, some physicochemical bases of life processes, the carbohydrates and their metabolism, the lipids and their metabolism, the proteins and their metabolism, the inorganic elements and their metabolism, the vitamins, feeding experiments—the determination of digestibility, nutritional balances, measures of total nutritive energy, the fasting catabolism—maintenance, growth, reproduction, lactation, and work production.

[Abstracts of papers on animal nutrition presented at the 31st annual meeting of the American Society of Biological Chemists] (*Jour. Biol. Chem., 119 (1937), No. 1, pp. xxxiv, xxxvi, xxxvii, xxxviii, xxxix, xlvi, xlvii, lx, lxi, lxvi, lxvii*).—Abstracts of the following papers dealing with subjects of significance in animal nutrition are noted: Effect of Deficiencies of Rat and Chick Antidermatitis Factors on Puppies on a Synthetic Diet, by P. J. Fouts, S. Lepkovsky, O. M. Helmer, and T. H. Jukes; Studies of the Perosis-Preventing Properties of Manganese, by W. D. Gallup and L. C. Norris; Basal Metabolism of Rats on a Phosphorus-Deficient Diet, by H. Goss and M. Kleiber; Physiological Effects of Phenol-Contaminated Drinking Waters, by V. G. Heller and L. Pursell; Fractionation of the Vitamin G Complex, by S. Lepkovsky and T. H. Jukes; and The Blood Precursor of Milk Fat, by L. A. Maynard, A. Hodson, G. H. Ellis, and C. M. McCay.

[Investigations with livestock in Montana] (*Montana Sta. Rpt. 1936, pp. 18–21, 50–52*).—Beef cattle studies at the Northern Montana Substation gave information on the economy of limited feeding of breeding cattle and the comparative birth weight, rate of gain, and market value of the progeny of large-type v. small-type bulls. Cooperative studies at the U. S. Range Livestock Experiment Station gave results on the value of Russian-thistle as a winter feed, the value of cottonseed cake as a winter supplement for breeding cows, and winter feeding costs for the breeding herd. The results of grazing sheep on range throughout the year are noted.

[Livestock investigations in Nevada] (*Nevada Sta. Rpt. 1936, pp. 28, 29*).—Progress is reported on studies dealing with milk v. tankage as supplements to barley and alfalfa meal for growing pigs, the protein and mineral requirements of turkeys, and the economic efficiency of alfalfa hay as a sole ration for dairy cattle and its relation to sterility, all by F. B. Headley.

Intensive pasture management, C. B. Bender (*New Jersey Stas. Bul. 633 (1937), pp. 12, figs. 4*).—A pasture lay-out plan suitable for an intensive system of management is presented, along with a program of fertilization, cultural practices, procedure for renovating old pastures or establishing new ones, and desirable grazing practices.

Experimental results have indicated that intensively managed pastures have yielded a greater net return in terms of feed replacement value than could be obtained from any cereal or hay crop. While the yield of either fertilized or unfertilized pastures was largely determined by the amount of rainfall, it was found that the percentage return in favor of fertilization was many times greater during a dry year than during a normal season. The ratio in favor of heavy nitrogen with minerals as compared with mineral treatment without nitrogen was 2:1 in a normal season and 5:1 in a dry season.

The mineral needs of farm animals (*Ohio Sta. Spec. Circ. 49 (1937), pp. 7*).—This circular briefly discusses the mineral requirements, the effectiveness of various types of rations in meeting these demands, and simple mineral mixtures that will adequately supply the needs of dairy cattle, beef cattle, sheep, swine, and chickens.

Comparison of the distribution of magnesium in blood cells and plasma of animals, D. F. Eveleth (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 289–292*).—This contribution from the Iowa Veterinary Research Institute presents data on the distribution of magnesium in the blood cells and plasma of normal mice, rats, guinea pigs, rabbits, chickens, horses, swine, goats, sheep, and dairy cattle. For the various species studied, only cattle showed higher plasma magnesium than cell magnesium. These data and those from other sources indicate that low cell magnesium is confined to ruminants. There does not appear to be any regularity in the relation of cell to plasma magnesium.

Cobalt as an essential element in animal nutrition, W. M. Neal and C. F. Ahmann (*Science, 86 (1937), No. 2227, pp. 225, 226, fig. 1*).—This note from the Florida Experiment Station describes a type of malnutrition occurring in calves confined to a diet of locally grown Natal grass hay, shelled corn, and dried skim milk. It was corrected by the addition of a cobalt supplement but apparently aggravated by the use of ferric ammonium citrate or copper sulfate in the diet. No calves on the basal diet were raised to a weight of over 450 lb., and all calves exhibited characteristic deficiency symptoms, while those receiving the cobalt supplement grew more rapidly and appeared normal on post-mortem examination.

Trace elements in relation to bush sickness, E. M. Wall (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 8, pp. 642–650, figs. 5*).—A series of investigations on the effect of administering iron compounds and some trace elements to bush-sick sheep gave evidence that traces of catalytic elements other than copper and cobalt, and possibly including nickel, manganese, and zinc, may be necessary to effect the complete utilization of the iron in soils and pastures. It is suggested that when no available iron is added to the diet a larger amount of cobalt may be required to make the iron preseut in the soils and pastures available for animal nutrition.

Improved nomographic charts for determining the relative value of feeds, G. W. Salisbury, J. I. Miller, and A. Z. Hodson (*Jour. Dairy Sci., 20

(1937), No. 9, pp. 567–576, figs. 4).—Based upon the Petersen method (E. S. R., 68, p. 806), the authors have presented a series of nomographic charts by which it is possible to readily compare the value of feeds by three different methods, namely, (1) according to the Petersen method, allowing a premium for protein-rich feeds, (2) solely on the basis of their relative total digestible nutrient content or net energy value, and (3) on the basis of their relative cost per 100 lb. of total digestible nutrients or per 100 therms of net energy.

Vitamin content of commercial feeds should be measured, C. O. Willits (*Farm Res.* [*New York State Sta.*], *4* (*1937*), *No. 1, p. 8*).—The author points out the need for simple methods of examining feeds that will indicate the kind and amounts of vitamins present in order that satisfactory regulatory measures governing this phase of commercial feed production may be made effective.

Assay procedure for vitamin K (antihemorrhagic vitamin), H. J. Almquist and E. L. R. Stokstad (*Jour. Nutr.*, *14* (*1937*), *No. 3, pp. 235–240*).—This report from the California Experiment Station describes a rapid technic for the assay of vitamin K supplements for chicks based on the time required for blood samples to clot after chicks have been depleted and then subjected to the test diet for an adequate period. Most satisfactory results have been obtained from a 2-week test period, starting chicks on the experimental diets immediately after hatching. It is shown that this procedure is capable of detecting slight deficiencies as well as complete deficiencies of vitamin K. The determination of hemoglobin levels is unnecessary in such assay since vitamin K deficiency is not considered a primary cause of anemia in chicks. Tests with 1, 2, and 5 percent of soybean oil as supplements to a deficiency diet demonstrated that vitamin K is present in this product, 2 percent providing an adequate level.

The composition of corn fodder grown in drouth years, L. D. Haigh and A. G. Hogan (*Missouri Sta. Bul. 390* (*1937*), *pp. 6*).—This bulletin presents data on the chemical composition of normal and drought-stricken corn stover from upland and river-bottom fields, of drought-stricken fodder from experimental plats subjected to various fertilizer treatments and cut at different stages, and of silages prepared from normal corn, drought-stricken corn, Atlas sorghum, and a timothy-wheat mixture. A principal difference observed was the higher protein content of the stover and silage from the drought-stricken corn than from corn grown in normal years.

Stack silage, R. E. Hodgson and J. C. Knott (*Washington Sta. Bul. 348* (*1937*), *pp. 34, figs. 13*).—The Western Washington Experiment Station and the U. S. D. A. Bureau of Dairy Industry cooperated in these studies. In each of three trials similar material was ensiled by the stack method and in an upright silo. Peas and oats (chopped) were ensiled in 1934, early spring pasture growth (chopped) in 1935, while in 1936 early pasture growth was ensiled but was stacked without chopping. The stacks were prepared by filling a shallow pit and extending the stack to considerable height above the ground and covering with dirt.

In each trial the stack method resulted in a palatable silage of good quality and high nutritive value. Losses in dry matter through spoilage averaged about 7 percent in the silo and 10 percent in the stack, while losses from other causes were equal by either method. There was little difference in the average digestibility of the various constituents of the silage by these two methods. For every 100 lb. of dry matter ensiled there was recovered in the form of good silage 4.8 and 4.3 lb. of digestible crude protein and 42.1 and 40 lb. of total digestible nutrients from the silo and stack, respectively.

Maximum silage temperatures in the two lots did not vary greatly. The temperature increased more slowly in the stack than in the silo, but was maintained at a higher level over a longer period. The stack method was fully as efficient as the silo in producing a feed with high carotene content. There was little difference in the quality of the silage produced from the uncut material in the stack and similar chopped material in the silo. Stacking the material in a very wet condition resulted in a noticeable production of butyric acid, although this condition apparently did not affect the palatability of the silage.

Precautions to be observed in preparing the stack to prevent excessive spoilage are discussed.

Commercial feeding stuffs, 1936–37, E. R. Tobey (*Maine Sta. Off. Insp. 164 (1937), pp. 56*).—This is the usual report of the analyses for protein, fat, and fiber of 909 samples of feeding stuffs collected for official inspection during the year ended June 30, 1937 (E. S. R., 76, p. 518).

A contribution to the study of African native cattle, H. H. Curson and R. W. Thornton (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 7 (1936), No. 2, pp. 613–739, figs. 90*).—This profusely illustrated article describes in considerable detail various indigenous breeds of African cattle. Suggestions are offered concerning the desirability of improving native stock through selection and the ill effects of indiscriminate cross-breeding.

Zebu (Brahman) cross cattle and their possibilities in North Australia: Co-operative investigations in Queensland.—Progress report No. 2, R. B. Kelley (*Sydney: Austral. Council Sci. and Indus. Res., 1936, pp. [3]+35, pls. 9, fig. 1*).—This second report (E. S. R., 68, p. 655) deals with the adaptation of imported zebu cattle and their progeny to Australian environment, the general appearance and characteristics of the cross-breds including ¼-, ½-, and ¾-bred zebus, and a comparison of the size and weight of the cross-breds with British breeds. The proposed future breeding program is discussed.

Feeding cattle at the Washington Experiment Station, R. McCall and H. Hackedorn (*Washington Sta. Bul. 352 (1937), pp. 22*).—Portions of this report are based on experimental data previously published (E. S. R., 72, p. 89).

The results of recent experiments gave evidence that first-year sweetclover or a combination of equal parts of first-year sweetclover and wheat hay were equal to alfalfa when fed with grain to fattening steers. A combination of equal parts of second-year sweetclover and wheat hay with grain resulted in 9 percent lower gains than were obtained on the alfalfa ration.

In one trial comparing the fattening qualities of steers and heifers, the steers gained 0.25 lb. more per head daily, sold for 49 ct. per hundredweight higher, and yielded carcasses of better grade than a similar group of heifers.

The costs of marketing by rail and by truck proved to be approximately the same, the lower rate by rail being offset by 1.55 percent less shrinkage in live weight in cattle transported by truck. The average loss in weight of cattle from feed lot to market averaged 1.6, 2.77, and 1.34 percent for 2-year-olds, yearlings, and calves, respectively.

Cacao shell as a foodstuff for cattle, J. Golding and H. Burr (*Agr. Prog. [Agr. Ed. Assoc., Gt. Brit.], 14 (1937), No. 1, pp. 44–52, figs. 2*).—Feeding experiments with a limited number of animals gave evidence that the feeding of 2 lb. daily of cacao shells to milking cows significantly increased both the yield and butterfat content of the milk.

Iron and copper in a normal calf ration, C. E. Knoop, W. E. Krauss, T. S. Sutton, and R. G. Washburn (*Ohio Sta. Bimo. Bul. 188 (1937), pp. 129–135*).—In this experiment three groups of Holstein male calves were on trial to

8½ mo. of age. All groups received whole milk, grain, and alfalfa hay to 6 mo. of age, and mixed hay and grain from 6 mo. to the end of the test. Lots 2 and 3 received supplements of iron chloride and copper sulfate so that the rations for lots 1, 2, and 3 contained 0.0170, 0.0279, and 0.0369 percent of iron, 0.0013, 0.0035, and 0.0022 percent of copper, and had an iron-copper ratio of 13:1, 8:1, and 17:1, respectively.

Data are presented on the rate of growth; the erythrocyte and hemoglobin content of the blood; the blood serum calcium and phosphorus content; the weights of testes, spleens, livers, and hearts; the iron and copper content of the livers and testes; and the physical and chemical properties of certain bones. Differences due to the iron and copper supplements in the ration were not pronounced, although there was some indication that copper feeding was beneficial. The storage of iron and copper in the livers was markedly increased by the supplemented diets. Apparently the levels of iron and copper supplied in the basal ration were adequate for normal growth of calves to 8½ mo. of age.

What causes "black cutter" beef? H. R. Guilbert (*Jour. Heredity, 28 (1937), No. 6, pp. 213–215*).—Since dark or black cutting beef has not been produced by experimental treatment and was evident in the early breeds, the condition is considered hereditary.

Recent changes in sheep breeding in the arable areas, I, II, R. P. Askew (*Jour. Min. Agr.* [*Gt. Brit.*], *44 (1937), Nos. 5, pp. 450–457; 6, pp. 562–571*).—This article discusses trends in the sheep population in England and Wales in recent years. Particular emphasis is placed on the shift of population from the arable to the grassland counties, the decline in the long-wool breeds in favor of the down breeds, the changes in number and distribution of the down breeds, and the increase in crossbreeding. The need for standardization in sheep production is emphasized.

Fitting sheep into plains farming practices, G. E. Morton, E. J. Maynard, and J. F. Brandon (*Colorado Sta. Bul. 436 (1937), pp. 78, figs. 17*).—This bulletin reports the results of 11 years' experimentation conducted jointly by the station and the U. S. D. A. Dry Land Field Station, Akron. Three areas of 10 acres each, but differently managed, were grazed with ewes and their lambs over each of the 11 years. One area was permanently maintained in native short-grass sod; a second area was divided into five equal plats, one of which was left permanently in native sod and the other four used in a rotation of winter rye, winter wheat, corn, and barley; and the third area, similarly divided, was used in a rotation of fallow, winter wheat, corn, and barley.

The native sod area provided pasturage for an average of 131 days annually, and the average gain in live weight for 10 ewes and their lambs on the 10-acre area was 493.2 lb. The rye-wheat-corn-barley rotation with native sod supplied an average of 157 days' grazing for from 6 to 10 ewes and their lambs, with an average annual gain of 444.3 lb. The fallow-wheat-corn-barley rotation with native sod gave an average of 136 days' grazing for from 6 to 10 ewes and their lambs, with an average annual gain of 379.2 lb. Pasturing sheep on the rye in the first rotation instead of plowing it under for green manure saved one or two weed-eliminating cultivations and two plowings every 4 yr. In addition, each crop in the rotation yielded higher on the grazed areas than with corresponding ungrazed areas. Pasturing sheep on the weeds on fallow land saved two weed-eliminating cultivations but resulted in a 30-percent lower average yield of wheat than on similar ungrazed areas, while other crops in the rotation were only slightly affected. The pastured fallow land averaged 15.5 percent more wheat than the pastured rye land.

These results indicate the practicability of sheep on dry-land farms. A rotation of winter rye, corn, barley, fallow, and winter wheat in connection with native sod pasture proved to be a desirable scheme of management that would provide approximately 195 days of annual grazing for sheep.

Effect of protein deficiency in the ration on the amount of feed consumed by lambs, J. I. MILLER (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 6*, *pp. 467–474*, *fig. 1*).—In studies at the [New York] Cornell Experiment Station a synthetic diet of purified ingredients containing 20 percent of casein has given consistently good results with sheep. When a very low nitrogen diet in which the casein was replaced by starch was fed to three lambs, feed consumption was normal for a few days, indicating that such a ration was palatable. However, the lambs soon began to refuse feed and gave definite evidence of severe digestive disturbances. They did not regain appetite and consistently lost in weight so long as this ration was fed. When a purified diet containing considerable protein or a diet of natural feeds replaced the low nitrogen diet lambs showed complete recovery within a few days. Apparently the digestive disorders brought on by the feeding of the low protein ration caused the lambs to desire less feed.

Lamb feeding experiments, H. HACKEDORN, H. P. SINGLETON, and J. SOTOLA (*Washington Sta. Bul. 351* (*1937*), *pp. 34*, *figs. 4*).—This bulletin presents the results of 14 years' study on the value of various feeds, feed combinations, and methods for feeding range lambs which were not fat enough to market as fat lambs during the regular (August and September) shipping season, or the so-called "cut-back" lambs.

Three trials with different cuttings of alfalfa and sweetclover hay indicated a slight advantage in favor of first-cutting alfalfa over third cutting, which in turn was slightly superior to second cutting, while sweetclover produced equal gains to those on first-cutting alfalfa, but a much higher percentage of sweetclover was refused and wasted. Trials with varying levels of grain feeding indicated that 1 lb. or more of grain per head daily was required for satisfactory gains. Trials with long, chopped, and ground hays showed a distinct advantage for the ground hay in terms of feed replacement value. Well-matured irrigated corn proved equal to No. 2 Eastern corn. Shelled corn, whole barley, whole wheat, and whole oats ranked in this order as to their effectiveness in promoting gains. Grinding or steam-rolling barley, wheat, and oats did not prove profitable. As a supplement to alfalfa, corn alone was from 20 to 25 percent more valuable than a mixture of corn and wheat 1:2. Feeding whole potatoes at the rate of from 1 to 1.5 lb. per head daily proved profitable. Chopping potatoes did not improve their value. Corn silage proved a very satisfactory feed, but the low prices of hay and such succulent feeds as cull potatoes, apples, squash, carrots, and rutabagas, all of which proved satisfactory, have retarded the extensive use of silage. Beet molasses was satisfactorily fed at the rate of from 0.5 to 1 lb. per head daily and had a relatively high feed replacement value. Delaying grain feeding for 30 days was less satisfactory than feeding 1 lb. of grain per head daily over the entire fattening period.

Total ash of sheep's bones as an index to calcification, S. W. JOSLAND (*New Zeal. Jour. Sci. and Technol.*, *18* (*1937*), *No. 8*, *pp. 665–668*).—Information is presented on the total ash content of a number of different bones from the skeletons of sheep representing a range of ages and conditions. Considerable variation was noted in the total ash content of the various bones, but the head of the femur and the proximal epiphysis of the humerus apparently gave a reliable index of the degree of calcification. The results indicated that bone calcification is relatively complete in the lamb at 4 mo. of age.

Studies in mineral metabolism.—XXXV, The role of iodine in the nutrition of sheep, A. I. MALAN, P. J. DU TOIT, and J. W. GROENEWALD (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, *7 (1936), No. 2, pp. 523–532, fig. 1*).—Continuing this series (E. S. R., 77, p. 677), further studies were conducted on the effect of adding potassium iodide to the diet of breeding ewes. Four groups of 10 ewes each were fed rations over a 12-mo. period, consisting of (1) hay and corn plus 0.05 g daily of potassium iodide, (2) the same as group 1 plus 200 g of green feed daily, (3) the same as group 2 plus 50 g of blood meal, and (4) the same as group 3 but omitting the potassium iodide.

No ill effects of the iodine supplement were observed on body weight or feed consumption. However, reproduction was abnormal in all groups receiving potassium iodide, the effect being most serious in group 1. The condition was partially alleviated by the addition of carotene in the green feed and still further by improving both the carotene and protein content of the ration. It is concluded that, under practical conditions when green feed is frequently inadequate and protein is of poor quality, the addition of potassium iodide to salt licks is a distinctly dangerous practice.

The body proportions of different breeds of bacon pigs, J. HAMMOND and G. N. MURRAY (*Jour. Agr. Sci. [England]*, *27 (1937), No. 3, pp. 394–431, pls. 2, figs. 7*).—The material used in this study consisted of cured and smoked sides of bacon exhibited at the London Dairy Show from 1922 to 1931. Eight breeds and three cross-bred lots were represented. All pigs were weighed, slaughtered, and cured at one plant and under uniform conditions. Data on the breed, sex, age, live weight, carcass weight, and bacon weight, and four carcass measurements, namely, length of side, belly thickness, thickness of back fat, and flank thickness were available.

Statistical analyses of these data indicated that actual live weight affects the carcass percentage more than does breed or type. For 200-lb. bacon pigs a carcass percentage of about 79 is considered optimum, below which there is too large a proportion of bone and above which there is too great a proportion of fat. Comparing increase in weight of the side with other characters, proportional increase in length of side was much less than increase of weight, both belly thickness and thickness of shoulder fat increasing proportionally faster than length but slower than weight, and only thickness of fat over the loin increased proportionally faster than weight. The subcutaneous fat layer matured first over the shoulder, over the rump next, and over the loin last, and the ratio between the thickness of fat at the shoulder and at the loin decreased as weight of side increased. Breed differences and the effects of cross-breeding are discussed. For each unit of increase in side length the pork type increased much more in side weight than the bacon type. At equal side length sows had a thicker belly and thinner back fat than castrated males. Castration in either sex increased thickness of back fat, while in sows it also decreased belly thickness.

A study of the fasting metabolism of various breeds of hog.—III, Metabolism and surface area measurements, T. DEIGHTON (*Jour. Agr. Sci. [England]*, *27 (1937), No. 3, pp. 317–331, figs. 4*).—Continuing this series of investigations (E. S. R., 74, p. 87), the relationship between the metabolism of pigs as determined in previous trials and body surface area was studied. Surface area was determined either by a photographic method previously described (E. S. R., 69, p. 566) or by use of a formula based on the weight and length of the individuals. The results indicated that the metabolism of pigs in a state of inanition is more a function of a power of the weight than of the true surface area as determined by the photographic method. Studies of variation

in metabolic rate of hogs born in summer and autumn showed two maxima of metabolism, one almost immediately after birth and another during the following summer. A comparison of actual and theoretically computed growth curves for 11 pigs showed that while on the average there was a very close agreement, individual growth curves showed rather wide variation, leading to the suggestion that net energy is a statistical rather than a physiological constant.

A study of certain breeding practices in pig production, A. M. SHAW and J. W. G. MACEWAN (*Sci. Agr., 16 (1936), No. 6, pp. 322–330, 336; Fr. abs., p. 336*).—This is a report of a 5-yr. swine-breeding program at the University of Saskatchewan in which four purebred sows of each of the following breeds, Tamworth, Yorkshire, Poland China, Berkshire, and Duroc-Jersey, were mated during successive breeding seasons to a Tamworth boar, a Yorkshire boar, a Poland China boar, a Berkshire boar, and a Duroc-Jersey boar. In this manner all possible crosses were made, furnishing five groups of purebred and 20 groups of cross-bred pigs. Data are presented on number of pigs weaned, weaning weights, rapidity and economy of gain, and the suitability of the finished pigs as indicated by market grades.

As a whole the cross-bred pigs averaged 3.7 lb. heavier at weaning, gained 0.09 lb. more per day, and required 11 lb. less grain equivalent (grain and buttermilk) per 100 lb. of gain than the purebreds. No definite conclusions were reached as to the most efficient breed or cross from this study. On the basis of market grade the Tamworth and Yorkshire purebreds and cross-breds were markedly superior for the production of suitable bacon carcasses, while of the other three breeds the Duroc-Jersey appeared to cross to best advantage with Tamworths and Yorkshires in the production of suitable bacon pigs.

Value of forage in swine feeding, T. B. KEITH and M. A. MCCARTY (*Pennsylvania Sta. Bul. 346 (1937), pp. 11, figs. 2*).—These investigations were designed to give information on the effect of different levels of grain feeding on the growth of pigs while grazing on abundant forage and to determine the relative value of Dwarf Essex rape, White Blossom sweetclover, and alfalfa as forage crops for swine. In a trial with each of the three forages, four lots of 10 pigs each received a full feed of grain in dry lot and a full, three-fourths, and one-half feed of grain on forage, respectively. The trials on rape and alfalfa each extended over an 84-day period and the trial on sweetclover over a 49-day period.

Pigs full-fed grain on rape, sweetclover, and alfalfa made 30, 24, and 31 percent greater gains and made 1 lb. of gain on 23, 18, and 24 percent less grain, respectively, than pigs full-fed grain without forage. Pigs fed three-fourths of the daily grain allowance on rape, sweetclover, and alfalfa made 1 lb. of gain on 20, 25.2, and 31 percent less grain, respectively, than the dry-lot groups while making approximately the same daily gains. Pigs fed one-half of the daily grain allowance on rape, sweetclover, and alfalfa made 1 lb. of gain on 36.2, 35.9, and 38 percent less grain, respectively, than the dry-lot-fed groups, although making somewhat slower daily gains. A comparison of the grain requirement for each pound of gain indicated very little difference in the value of the three forages at any given level of grain feeding. The gilts fed the one-half or the three-fourths grain allowance on forage were considered ideal for breeding from the standpoint of growth and thrift.

Barley as a feed for hogs, E. H. HUGHES (*California Sta. Circ. 343 (1937), pp. 8*).—Data compiled from various sources are presented to indicate the value for hogs of barley alone and in combination with various protein concentrates, with and without green forage. Barley as the sole ration exhibits a

number of nutritive deficiencies, including vitamin D and calcium, vitamin A, vitamin G, and certain essential proteins. Green forage has a definite supplemental value when fed with barley, and a combination of barley and protein concentrates fed in dry lot produced more rapid gains than barley and green pasture, indicating that barley proteins plus those secured from pasture are not entirely adequate for rapid gains.

Sweet potatoes for pigs, F. R. EDWARDS (*Amer. Fert.*, 87 (1937), No. 4, pp. 24, 26).—Tests at the the Georgia Experiment Station have indicated that sweetpotatoes alone are unsatisfactory for fattening hogs, but that they can be fed to excellent advantage when supplemented by tankage or other suitable sources of protein, minerals, and limited amounts of corn. It is recommended that the protein and mineral supplements be self-fed and that the corn be hand-fed, preferably late in the day. Pigs made better gains when allowed to graze or root up the sweetpotatoes in the field rather than when they were hand-fed in a pen or lot. They had a tendency to overcome the softening effect of peanuts on the pork.

Biological value of casein as a supplement to the proteins of barley in rations for pigs, E. H. HUGHES (*Jour. Agr. Res.* [U. S.], 55 (1937), No. 6, pp. 461–465).—Experiments at the California Experiment Station compared rations containing barley as the only source of protein, barley plus 10 percent of dried brewers' grains, barley plus 1.5 percent of commercial casein, and barley plus 1.5 percent of lactoflavine-free casein, respectively, for young growing pigs.

When the proteins of barley were the only source of protein, pigs grew very slowly and required a large quantity of feed per unit of gain. The addition of brewers' grains resulted in an increased rate of gain and a lower feed requirement, and the addition of commercial casein caused a marked increase in rate of gain and a large reduction in the amount of feed required per unit increase in body weight. Pigs receiving the casein washed free of lactoflavine gained only one-half as rapidly as those on normal casein, suggesting that the beneficial effects of casein may be primarily due to its lactoflavine content.

The composition and digestibility, when fed to pigs, of three grades of meat meal of widely differing fat content, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci.* [*England*], 27 (1937), No. 3, pp. 465–473).—The report from the School of Agriculture, Cambridge University, describes digestion trials with pigs on three lots of meat meal prepared from a common source of raw material but so processed that the lots contained 18.8, 11.1, and 3.2 percent of fat, respectively. The digestion coefficients of organic matter were 88.3, 93.1, and 83.9, of crude protein 90.9, 93.9, and 87.9, and of ether extract 95.4, 89, and 82.3 percent for the high, medium, and low fat meals, respectively. It is suggested that the solvent used in extracting the low fat meal resulted in a distinct lowering of the digestibility of the meal. This product was most comparable to whitefish meal in both digestible and mineral composition, although containing a higher proportion of nonprotein nitrogenous material.

A method of curing pork when the weather is too warm for natural chilling, W. E. SEWELL (*Alabama Sta. Leaflet 17* (1937), pp. 3).—The method presented briefly consists of boning the warm carcasses of hogs weighing not more than 230 lb., cutting the halved carcass into rough squares consisting of hams, bacon, shoulder, and jowl, thoroughly salting the meat and packing it in a barrel with an equal weight of ice, draining and dry salting at the end of 24 hr., and repeating this procedure at the end of the third day of dry salt cure, and finally removing the meat from the salt pack at the end of 7 days' dry cure, washing off the surplus salt, and hanging for smoking.

This method was tested in every month of the year, and all of the cures were successful except that the fat in some of the pieces cured in July and August became rancid.

Studies on nutritive efficiency of commercial dog foods, A. ARNOLD and C. A. ELVEHJEM (*[Chicago: Wilson & Co., 1937], pp. [1]+15, figs. 4*).—In a study carried on at the University of Wisconsin, comparison was made of the nutritive value of 18 samples of commercially canned dog foods in feeding trials with both rats and chicks. These were found to vary widely in growth-promoting value, seven proving to be of excellent quality while the remaining 11 ranged from borderline to poor. The energy, protein, carbohydrate, and fat requirements of dogs are discussed, and tentative feeding standards are offered. The minimum mineral requirements for dogs are also indicated. No evidence of mineral deficiency was observed in the animals fed any of the dog foods used in these experiments. The minimum vitamin requirements per pound of canned dog food (fresh basis) were calculated to be 635 U. S. P. units of vitamin A, 20 international units of vitamin B_1, and from 10 to 13 U. S. P. units of vitamin D. Other vitamins were apparently supplied in adequate amounts in all foods tested.

[Poultry studies, I, II], H. B. HINDS (*Arizona Sta. Bul. 159 (1937), pp. 169–182, figs. 2*).—Two series of studies are reported.

I. *The comparative nutritive value of certain locally produced poultry rations* (pp. 171–176).—Three tests (11 mo. each) were conducted to compare the value of yellow corn meal, red milo, and barley when each was used as a principal cereal ingredient in both the mash and scratch rations of laying White Leghorn pullets. Four pens of pullets used in each trial were fed the well-balanced check ration, the corn, the red milo, and the barley ration, respectively.

There was little difference in total feed consumed by any lot, and preference was always shown for the grain portion of the ration, indicating that palatability of the different grains was not a factor. Egg production was highest on the check ration, followed in order by the red milo, barley, and corn groups. Average egg weight was highest on the red milo ration and lowest on the corn meal ration, with the other groups about equal. Based on prevailing feed prices, the feed cost per dozen eggs was lowest on the red milo ration, followed by the check lot, barley-, and corn-fed groups. Mortality was relatively high in all groups, but it was lowest on the red milo, followed by the barley, corn, and check groups in this order. It is concluded that the locally grown red milo and barley can be successfully used in poultry rations with proper vitamin supplements.

II. *Confinement rearing* (pp. 177–182).—Tests were conducted in three consecutive years comparing confinement on concrete floor, confinement on wire floor, and access to barley range for rearing chicks to 18 weeks of age.

There was little difference in the rate of growth, with a slight advantage favoring the outside run. The group on wire floors made the slowest growth and had rough and ragged plumage. The mortality was relatively high in all groups, but was lowest on the concrete floor group, followed by the outside run and wire floor groups.

The method of starting chicks in batteries and later transferring them to colony brooders was tested. Chicks started in colony brooders made the best gains, followed in order by chicks held in batteries for 2, 4, and 6 weeks. Difficulty was experienced in getting battery-confined groups to using the colony brooder. Total mortality was quite severe (from 22.7 to 30 percent) in all of these lots.

A practical poultry breeding index, W. C. Thompson and F. P. Jeffrey (*New Jersey Stas. Hints to Poultrymen, 24 (1937), No. 5, pp. 4*).—The breeding index, which is proposed as a means of evaluating the efficiency of a poultry breeding program for a single season, is based upon the hatchability of total eggs set, brooding and rearing viability, viability of adult stock in laying houses, intensity of lay, persistency of lay, and weight of five consecutive eggs when the hens are 10 mo. old, allowing maximum scores of 20, 15, 15, 25, 10, and 15, respectively, for the above items. Each item is discussed with reference to scoring a flock's performance.

Breeding chickens for rapid gains, E. E. Schnetzler (*U. S. Egg and Poultry Mag., 43 (1937), No. 8, pp. 474, 475, 512–514, figs. 4*).—This study at the Indiana Experiment Station gave evidence that by selecting the heaviest and lightest individuals from a Barred Plymouth Rock flock at 8 weeks of age, for use as foundation breeding stock, it was possible to develop strains differing markedly in growth rates. Over two generations the fast-growing stock consistently averaged heavier at maturity and also laid heavier eggs. There was little difference in annual egg production in the two groups, indicating that this character is independent of body weight.

Growth of cross-bred cockerels, C. S. Platt (*New England Poultryman and Northeast. Breeder, 24 (1937), No. 3, p. 33*).—Weekly weights up to 12 weeks of age and the feed required to produce 1 lb. of gain at various ages for cross-bred cockerels (Rhode Island Red male × Barred Rock female) are presented.

Poultry brooding systems, E. W. Callenbach, J. E. Nicholas, and P. H. Margolf (*Pennsylvania Sta. Bul. 340 (1937), pp. 40, figs. 3*).—Seven methods of brooding, namely, hot water, electric and hot water, electric, coal, oil, gas, and battery, were compared in this investigation involving large numbers of Single Comb White Leghorn and Barred Plymouth Rock chicks. A total of 1,545 pullets was reared to 10 weeks of age, and 1,185 were continued on experiment until 74 weeks of age. The biological response of the pullets to the different methods of brooding was measured in terms of body weight, plumage growth and condition, sexual development, mortality, egg production, and egg weight.

Within the range encountered, brooder pen temperature and relative humidity did not affect growth, age of sexual maturity, or plumage growth and condition in chicks. The periodic and total flock mortality of both varieties of chicks were relatively low. The electric brooders employing exposed "black heat" resistance coils definitely retarded sexual development of both breeds as measured by age at first egg. These later-maturing pullets were heavier at sexual maturity and laid heavier eggs at that time. The protein content of the ration did not influence the rate of sexual development. It is concluded that the proper management of any good brooder, and not the particular style of brooder or kind of fuel used, is the most important consideration in the successful rearing of pullets.

The digestion of huskless oats by poultry, F. E. Moon and B. Thomas (*Jour. Agr. Sci. [England], 27 (1937), No. 3, pp. 458–464*).—Experiments at Armstrong College, England, compared the digestibility of a recently introduced huskless variety of oats which contained only 1.63 percent of crude fiber with a common variety (Victory) containing 9.02 percent of crude fiber. The fiber of the huskless variety proved totally indigestible, while that of the common variety was 8.8 percent digestible. Organic matter, crude protein, ether extract, and nitrogen-free extract showed digestible coefficients of 69.8 and 86.2, 77.4 and 82.2, 83.5 and 62.4, and 76.8 and 90.8 for the common and huskless varieties.

respectively. The starch equivalent of the huskless variety was materially higher, comparing more closely with wheat, than with common oat varieties, indicating that it is a valuable feeding stuff.

Biological assay of lactoflavin with chicks, T. H. JUKES (*Jour. Nutr., 14 (1937), No. 3, pp. 223–233, figs. 4*).—In this study at the California Experiment Station a diet similar to that used by other workers in vitamin G assay with chicks (E. S. R., 76, p. 378) proved to be deficient in both lactoflavine and the filtrate factor, and the addition of crystalline lactoflavine failed to stimulate growth and provoked dermatitis in chicks. A basal diet consisting of yellow corn meal 30 percent, cornstarch 23, acid washed bran 10, washed casein 22, rice bran filtrate 7, sodium chloride 1, ground limestone 1, steamed bonemeal 1, crude soybean oil 3, and cod-liver oil 2 percent, plus a hexane extract of alfalfa meal equivalent to 1 percent of the ration proved satisfactory for lactoflavine assay with chicks. In conducting assays, the chicks were subjected to the basal diet for a depleting period of from 6 to 10 days and then to approximately a 2-week assay period. The addition of 0.6 mg of crystalline lactoflavine (exact purity undetermined) per 100 g of ration proved adequate for maximal growth, and the growth response to lower levels of lactoflavine was roughly in proportion to the amount fed. A chick unit is proposed which is equivalent to one-tenth of the daily amount which will just provide for maximal growth under the conditions prescribed. The requirement of chicks for maximal growth was about 100 units per 100 g of diet. The loctoflavine content of a number of feeding stuffs is reported, and the differences in distribution of lactoflavine and the filtrate factor in certain feeds is pointed out.

Sources and nature of the chick gizzard factor, H. J. ALMQUIST (*Jour. Nutr., 14 (1937), No. 3, pp. 241–245*).—In a further study of the properties and distribution of the chick gizzard factor (E. S. R., 77, p. 676), evidence is presented to indicate that this factor is fat-soluble. It remains in solution in hexane after much fatty material has been removed by chilling to 0° C. and filtering, while the solids removed are inactive. The factor was found to be in rice bran and in a hexane extract of rice bran, but not in the extracted product, while dried gizzard lining from normal chicks was found to be a potent source. It proved unstable to heat and to ethyl alcohol. A previous conclusion that the gizzard factor has no noticeable relation to the rate of growth in chicks was confirmed.

Wax picking of poultry, F. P. JEFFREY (*New Jersey Stas. Hints to Poultrymen, 24 (1937), No. 6, pp. 4*).—The equipment required and the various steps to be followed in the wax picking of poultry on the farm are discussed. Certain difficulties encountered in applying this method and the volume of business which will justify the cost of necessary equipment are indicated.

The correlation of methods for measuring the interior quality of eggs, C. H. PARSONS and L. D. MINK (*U. S. Egg and Poultry Mag., 43 (1937), No. 8, pp. 484–491, 509–512, figs. 5*).—The authors have studied the relation of the photographic score of eggs to other measures of interior egg quality, including yolk index, percentage thick albumin, albumin index, albumin area index (method for determination described), area of thick albumin, and albumin area index including yolk. These various methods show a fair correlation when working with large numbers of eggs, although there are many discrepancies when considering individual eggs. The apparent discrepancy in the measurement of eggs classed as "trades" is partially due to small eggs which are automatically included in this grade, although many were graded as extras or standards on the basis of quality. The photographic method of grading is considered fairly reliable when individual eggs are considered.

DAIRY FARMING—DAIRYING

[**Studies in dairy husbandry in the Southern States**] (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 95–109, 223–237*).—The following papers were presented before the dairy husbandry division at the thirty-seventh annual convention of the Association of Southern Agricultural Workers held at Jackson, Miss., February 5–7, 1936 (E. S. R., 74, p. 686): Factors Affecting Persistency of Milk Production, by A. H. Kuhlman, A. Nalbandov, and E. Weaver (pp. 95, 96); Results of Feeding Cottonseed Meal as a Supplement to Good Pasture for Growing Dairy Heifers, by F. R. Edwards (p. 96); Dairy Cattle Feeding and Grazing Experiment (A Progress Report), by B. P. Hazlewood (pp. 96, 97); The Response of Individual Cows to Milking Machines, by E. C. Elting (pp. 97, 98); *Lespedeza sericea* Feeding Trials With Dairy Cows, by C. E. Wylie and S. A. Hutton (pp. 98, 99); Ground Snapped Corn, by R. B. Becker (p. 99); The Results of Some Investigations in the Making of Hay and Silage, by T. E. Woodward (pp. 99, 100); Vitamin A Requirements of Dairy Cows, by O. C. Copeland (p. 100); A Study of Cottonseed Meal in the Ration of Dairy Cattle, by C. F. Huffman (p. 101); Bringing Production Records to a Comparable Basis, by J. P. LaMaster (p. 103); Some Factors Involved in a Balanced Dairy Farm Program, by J. S. Moore (pp. 105, 106); Sweet Potatoes for Milk Production, by R. H. Lush and S. Stewart (pp. 106, 107); Mungbean Silage for Milk Cows (A Preliminary Report), by A. H. Kuhlman and A. Nalbandov (pp. 107, 108); and The Value of Grinding Grains for Lactating Dairy Cattle, by A. L. Darnell and O. C. Copeland (p. 109).

The following papers were presented at the thirty-eighth annual convention, held at Nashville, Tenn., February 3–5, 1937: Utilization of Vitamin A by Dairy Cows, by G. S. Fraps, R. Treichler, A. R. Kemmerer, and O. C. Copeland (p. 223); Limited Grain Feeding of Dairy Cattle, by C. E. Wylie and L. R. Neel (pp. 223, 224); Changes in the Physical Properties of Butter Fat Produced by Feeding Cottonseed Meal, Alfalfa Hay, and Prairie Hay (Preliminary Report), by A. H. Kuhlman, W. D. Gallup, and A. Nalbandov (pp. 224, 225, 236, 237); Peanut Versus Soybean Hay for Dairy Cattle, by C. D. Grinnells and J. L. Moore (pp. 225, 235): All-Year Pasturing With and Without Concentrates for Dairy Cattle, by B. P. Hazlewood (pp. 230, 231); The Production of Jersey Cows on Roughage Rations, by J. A. Simms (pp. 231, 232); and Testing for Mastitis, by J. P. LaMaster and G. W. Anderson (p. 232).

[**Dairy cattle investigations in Montana**] (*Montana Sta. Rpt. 1936, pp. 47, 48*).—Progress is reported on an experiment at the Huntley Substation dealing with the improvement in productive capacity of a dairy herd through the continuous use of good proved sires and the use of high quality roughage as the sole ration for milking cows.

Relation of height at withers and chest girth to live weight of dairy cattle of different breeds and ages, H. P. Davis, R. F. Morgan, S. Brody, and A. C. Ragsdale (*Nebraska Sta. Res. Bul. 91 (1937), pp. 29, figs. 2*).—The tabulations and discussions presented in this bulletin are based on 10,921 sets of measurements taken on females of the Holstein, Jersey, Guernsey, and Ayrshire breeds at various ages from birth to maturity. The relation between chest-girth measurements and live weight in dairy cattle based on these and other data have been previously reported by the Missouri Experiment Station (E. S. R., 78, p. 84). In addition, tables are presented showing the chest girth and height at withers and corresponding weights for different age groups of each breed and also the relation between height at withers and weight for females of different breeds but of unknown age. From these data it is possible to estimate

with a reasonable degree of accuracy the weight of dairy females by measuring the chest girth and the amount of overweight or underweight by measuring the height at withers.

Feeding for profit in milk production, G. HEEBINK and H. O. HENDERSON (*West Virginia Sta. Circ. 74 (1937), pp. 28*).—The relation of feeding to profit, the character and composition of numerous feeding stuffs, the compounding of rations, and practical suggestions for feeding dairy cows are discussed in this popular circular.

The comparative values of peanut and soybean hay for milk production, *C. D. GRINNELLS and J. L. MOORE (North Carolina Sta. Bul. 312 (1937), pp. 28, figs. 6)*.—This bulletin presents results of three double reversal feeding trials with milking cows. Each trial involved three 30-day experimental periods, with the hay under test, beet pulp, and a grain mixture comprising the ration. Peanut hay of good quality was compared with a rather fine stemmed Laredo soybean hay of similar quality in each instance.

There was an average refusal of less than 1 percent of the peanut hay and about 4.8 percent of the soybean hay. In each trial the peanut hay fed groups averaged slightly higher in milk and butterfat production, required less hay, beet pulp, and grain per unit of production, and gained somewhat more in live weight than the soybean hay fed groups. It is concluded that good peanut hay is of equal or slightly greater value than similar quality soybean hay, and that its value as a source of legume roughage for milk and butterfat production justifies more care in the handling and storage of such hay than it generally receives.

Timothy silage as a dairy feed, C. B. BENDER and H. H. TUCKER (*New Jersey Stas. Circ. 374 (1937), pp. 7*).—This circular presents data on the protein content of timothy at various stages of growth, the green yield and total protein yield per season from unfertilized and cyanamide-fertilized areas, the comparative yields of green matter and protein in timothy silage and corn silage, and the total cost per ton of corn, timothy, and timothy-clover silages. The green yield of timothy per acre averaged somewhat lower than corn, but the total cost per ton for timothy was materially lower than for corn silage. By adding 50 lb. of molasses per ton of green timothy at the time it was ensiled a palatable and nutritious silage was produced, as demonstrated in a feeding trial with dairy heifers. Timothy silages with moisture contents of 69.59 and 79.23 percent had carotene contents of 0.0063 and 0.0185 percent, respectively, on a dry basis, ranking this feed as an important source of carotene in a winter feeding program.

Milk products, W. C. HARVEY and H. HILL (*London: H. K. Lewis & Co., 1937, pp. VIII+387, figs. 73*).—This is in the nature of a companion handbook to Milk: Production and Control (E. S. R., 77, p. 94). It is essentially a public health textbook. Manufacturing methods for various dairy products are discussed in considerable detail.

Proceedings of the tenth annual State College of Washington Institute of Dairying (*Wash. State Col., Inst. Dairying Proc., 10 (1937), pp. IV+92*).—Twenty-one papers presented before the tenth annual meeting, held at Pullman, March 8–13, 1937 (E. S. R., 77, p. 92), dealing with the sanitation, processing, and merchandising of milk and its products are published in these proceedings.

The Indian buffalo milk under Philippine conditions, M. D. SUMULONG (*Philippine Jour. Anim. Indus., 4 (1937), No. 4, pp. 253–264*).—A study of the milk of 13 Indian buffalo cows indicated an average daily yield of 2.13 l, with an average specific gravity of 1.0305 and an initial acidity of 0.06 to 0.1 percent. The average results of chemical analyses were as follows: Water

83.6 percent, butterfat 7.07 to 7.2, total solids 16.07, solids-not-fat 9.1, ash 0.29, protein 4.89, casein 3.95 to 4.5, and lactose 4.9. The Indian buffalo is considered to be well adapted as a producer of milk for farm family needs and also to have great possibilities in butter and cheese manufacture.

The electrokinetic potential of milk fat, I–III (*Jour. Dairy Sci.*, *20* (*1937*), *Nos. 8, pp. 551–556, figs. 2; 9, pp. 605–610; 10, pp. 637–643, figs. 3*).—This series of studies was conducted at the Pennsylvania Experiment Station.

I. *General electrophoretic studies*, E. L. Jack and C. D. Dahle.—This general study considered the magnitude of the potential under normal conditions, the effect of various agents upon it, the correlation between changes in magnitude and certain known behaviors of fat globules, and the nature of the interface between the fat globule and the surrounding medium. An electrophoretic method was employed. Dilution of milk within the range of 1:100 to 1:800 had no effect on the mobility of the fat globules, and most determinations were made at a dilution of 1:200. Within a temperature range of from 15° to 30° C. changes in temperature resulted in changes in mobility equal to 2 percent per degree centigrade at 25°. Determinations on milk from five dairy breeds indicated no significant breed differences in mobility of the fat globules. The isoelectric point of fat globules was found to be at pH 4.3 in acetate and citrate buffers, indicating that the surface layer of the fat globule is essentially protein but that some other material with a lower isoelectric point, probably a phospholipid, is present. The addition of salts resulted in a change in mobility in accordance with valence and sign of the ions added.

II. *Relation to dairy processes*, C. D. Dahle and E. L. Jack.—In this phase of the study the effect of heating milk to different temperatures on the creaming power of the milk and on the electrophoretic mobility of the fat globules was determined when (1) whole milk was heated, (2) skim milk was heated and raw cream added later to make a 4-percent milk, and (3) cream was heated and raw skim milk added later to make a 4-percent milk. The creaming ability of the milk was reduced when the whole milk or the skim milk was heated above pasteurization temperatures but was unaffected when the cream was similarly heated and added to the raw skim milk. The electrophoretic mobility of the fat globules was increased by heating the milk or the cream above pasteurization temperature but was not affected when the skim milk was heated before combining with the cream. Heat treatment resulting in a reduced cream volume caused an increased fat content of the cream layer. In a study of the effect of homogenization on the clumping of the fat globules and their mobility, it was found that neither single-stage homogenization accompanied by clumping nor double-stage homogenization with no clumping affected the mobility of the fat globules, the clumps migrating with the same velocity as the individual globules. It is concluded that the electrokinetic potential is not an important factor in the creaming ability of pasteurized milk.

III. *Relation to the fat globule "membrane"*, E. L. Jack and C. D. Dahle.—In a series of cream samples, ranging from 17- to 81-percent butterfat, the electrophoretic mobilities of the fat globules were fairly constant up to a fat content of 65 percent but increased rapidly above that point. The lipoid phosphorus declined slightly as the fat content increased up to from 60 to 65 percent and then decreased very rapidly above that point, while the nitrogen decreased gradually with increased fat content. It is suggested that the point of the sharp break in the lipoid-phosphorus curve represents a level at which it becomes necessary to remove some of the fat globule membrane in order to obtain a cream of greater fat content. In washed creams most of the pro-

tein was removed by the first washing, followed by a slight gradual decline in subsequent washings, while the phospholipid content gradually decreased and the electrophoretic mobilities of the fat globule gradually increased through eight washings.

Synthetic milks, in which butterfat was dispersed in a phospholipid sol with a casein sol added or in a casein sol with a phospholipid sol added, closely resembled normal milk in the position of the isoelectric point and the slope of the pH-mobility curve, indicating that it is possible to reconstruct milk exhibiting the properties of normal milk and suggesting the probability of a double layer membrane on the surface of the fat globules.

Effect of feeding vegetable oils on the fat content of milk and on the quality of butter, M. C. Dutta, J. S. Francisco, S. Kamal, J. K. Mackijani, and R. Soundararajan (*Agr. and Livestock in India, 7 (1937), No. 4, pp. 503–508*).—The effects of adding either peanut oil or sesame oil in graded amounts (from 0.5 to 2 lb. per cow daily) to a good basal dairy ration were studied. The inclusion of oil in the diet had no significant influence on the milk yield or the butterfat content of the milk, but feeding at the rate of 2 lb. per animal daily caused a slight decrease in total dry matter consumption. The physical and chemical properties of the butter were materially altered by oil feeding, both lots imparting the characteristic flavors to the butter and resulting in a somewhat greasy product with a relatively high iodine absorption value. The oil feeding also resulted in a slight decrease in the carotene content of butter, but no difference in the vitamin A content was noted.

Oxidation in relation to off-flavors in milk and certain milk products, L. M. Thurston (*Food Res., 2 (1937), No. 3, pp. 255–272*).—This is a comprehensive review from the Florida Experiment Station of various factors involved in the development of the oxidized flavor defect in milk and milk products.

The oxidized flavor in milk from the individual cow, C. D. Dahle and L. S. Palmer (*Pennsylvania Sta. Bul. 347 (1937), pp. 30*).—The authors have investigated the possible relationship of a large number of factors to the spontaneous occurrence of oxidized flavor in the milk of individual cows.

Breed, stage of lactation, chlorine-lactose ratio, and lecocyte count of the milk had no effect in this respect, but the feed of the cow did influence this condition. Green feeds, such as pasture, alfalfa, and clover, inhibited the production of this off-flavor. Pasteurizing susceptible milk at 145° F. for 30 min. or 160° for 5 min. increased the tendency to oxidized flavor development. Incubating such milk at 98° greatly reduced the amount of off-flavor developed, and heating to 168° entirely prevented it. When oxidized flavors occurred the vitamin C content of the milk was reduced, although it appears that the same factor is not necessarily responsible for both conditions. Replacing the oxygen of susceptible milk by nitrogen and also homogenizing such milk at 2,000 lb. pressure prevented off-flavor development, but the flavor occurred when such milks were exposed to sunlight. Maleic acid added to milk did not prevent the off-flavor, but the addition of vitamin C, hydroquinone, and oat flour to milk was effective. Carotene added to butterfat was ineffective when this mixture was emulsified with susceptible skim milk. The plasma and serum carried the enzyme-like factor responsible for this off-flavor, which results from the oxidation of the lecithin in the fat globule membrane and the butterfat. This condition is accompanied by a reduction in the iodine number of the butterfat.

Relation of acidity of milk to oxidized flavor, E. O. Anderson, L. R. Dowd, and C. A. Stuewer (*Food Res., 2 (1937), No. 2, pp. 143–150, fig. 1*).—Studies by the [Connecticut] Storrs Experiment Station on the pasteurized milk in a

commercial plant indicated a marked seasonal variation in the titratable acidity of the milk, with evidence of a close association between apparent acidity and the development of oxidized flavor. The oxidized flavor defect was prevalent between November 10 and June 10 when the acidity ranged above 0.16 percent, but did not occur during the summer months when the milk was characterized by relatively low acidity.

In a series of experiments with mixed herd milk in January, February, and March, during which period the titratable acidity of the fresh milk was approximately 0.19 percent, neutralizing the milk to an acidity of 0.145 percent or lower was effective in the prevention of oxidized flavors in the pasteurized milk. Neutralizing to 0.15 percent did not prevent oxidized flavor in all cases, and the unneutralized high-acid milk invariably developed such flavors upon pasteurization.

Tuberculin-tested milk: A study of re-organization for its production, R. N. Dixey (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1937, pp. 111*).—This report deals with ways and means of developing a safe milk supply, with particular reference to the necessary procedures and the costs involved in establishing tubercular-free herds in England.

Believes experience justifies weigh-vat sampling, M. W. Yale (*Farm Res. [New York State Sta.], 4 (1937), No. 1, p. 16*).—As a result of experimental work conducted by the station (E. S. R., 76, p. 91), the State department of agriculture and markets has tentatively recommended that the more representative weigh-vat sampling of milk replace the practice of single-can sampling.

Can increase thickness of cream, J. C. Hening (*Farm Res. [New York State Sta.], 4 (1937), No. 1, p. 12*).—Normally produced pasteurized cream which has been cooled to 40° F. can be very materially thickened by warming it to from 80° to 84° in an internal tubular heater within a period of from 3 to 10 min. and then cooling it to a temperature of from 48° to 40° in an internal tubular cooler in the same period of time in which it was warmed. The time and temperature of warming and cooling are the principal factors controlling the increased thickness. A 10-min.-warming and 10-min.-cooling period gave a greater increase in thickness than corresponding 3-min. periods. Rich cream is thickened to a greater extent than light cream, although a noticeable difference results in 20-percent cream. The cause of this phenomenon has not been ascertained, but the practice is being quite widely adopted by commercial plants.

Alpine pastures are foundation of cheese making in Switzerland, C. D. Kelly and R. S. Breed (*Farm Res. [New York State Sta.], 4 (1937), No. 1, pp. 14, 15, figs. 4*).—This is a brief résumé of conditions prevailing in the Switzerland cheese industry.

Manufacture of sherbets and ices, S. L. Tuckey (*Ice Cream Rev., 21 (1937), No. 3, pp. 69, 70, 72, 74*).—This paper from the Illinois Experiment Station offers information regarding the influence of overrun and sugar content on hardness, the effectiveness of various combinations of stabilizers for controlling the body and overrun, and the effect of certain combinations of sugars on surface hardening and crystallization in the manufacture of water ices and sherbets.

The use of wine in ices, M. A. Joslyn and W. C. Cole (*Wines and Vines, 18 (1937), No. 8, p. 8*).—The California Experiment Station has conducted a series of trials to determine the suitability of five types of wine as flavoring materials in the preparation of ices. Several basic mix combinations were used. Claret and Riesling wines gave ices of pleasing flavor and good texture and were considered to have possibilities in the production of ices, whereas

Muscatel, Sherry, and Port wines imparted a less pleasing flavor and were considered unsatisfactory. A formula consisting of wine 25 percent, cane sugar 17, corn sugar 5, pectin 0.5, and sufficient citric acid to produce 0.5 percent acidity as citric acid was found to be satisfactory for the Claret or Riesling mix. Pectin proved definitely superior to an agar-gelatin base in both color and flavor. In general, wines were not satisfactory as the main source of flavor in ice creams and sherberts.

A comparison of brilliant green lactose bile and formate ricinoleate media for the detection of the *Escherichia-Aerobacter* group in milk and ice cream, H. W. Leahy (*Jour. Bact., 34 (1937), No. 3, p. 349*).—The relative effectiveness of brilliant green lactose bile broth 2 percent and of formate-ricinoleate broth for the routine detection of *Escherichia-Aerobacter* was studied on 369 samples of pasteurized milk and 173 samples of ice cream. Each medium gave a total of 219 positive presumptive tests, of which 90 percent were confirmed by Standard Methods on the former and 88 percent on the latter. It is concluded that the two media are equally useful in the routine detection of this group of organisms in pasteurized milk and ice cream.

Conference on sanitation of paper milk containers, reported by R. S. Breed (*Milk Sanit., 6 (1937), No. 9, pp. 11–13*).—This sets forth principles of sanitation that should govern the manufacture and use of paper milk containers, as formulated at a conference at the New York State Experiment Station, July 12, 1937.

Twenty-fifth annual report of the International Association of Milk Sanitarians, compiled by C. S. Leete (*Internatl. Assoc. Milk Sanit. Ann. Rpt., 25 (1936), pp. 404, figs. 18*).—The following papers were among those presented before the annual meeting held at Atlantic City, N. J., October 14–16, 1936 (E. S. R., 77, p. 847): Some Observations on Chlorine and Metals, by F. M. Grant (pp. 9–14); Investigation of the Amylase and Phosphatase Tests as an Indication of Pasteurization, by F. W. Gilcreas and W. S. Davis (pp. 15–39); Bactericidal Property of Milk, by R. B. Little (pp. 105–119); A Study of Milk From Apparently Normal Udders, by C. K. Johns (pp. 145–164); Experiences in Meeting Milk Flavor Problems, by C. L. Roadhouse (pp. 201–209); The Influence of Method of Sterilizing Equipment on Development of Oxidized Flavors in Milk, by A. C. Dahlberg and D. C. Carpenter (pp. 210–222); The Influence of the Ration on Milk Flavor, by J. A. Anderson (pp. 223–241); Methods Commonly Used to Determine the Fat Content of Frozen Desserts, by A. H. Robertson et al. (pp. 283–289); and New Problems in Ice Cream Sanitation, by F. W. Fabian et al. (pp. 330–346).

The Pennsylvania Association of Dairy and Milk Inspectors, thirteenth annual report, 1937, compiled by G. E. Morris (*Penn. Assoc. Dairy and Milk Insp. Ann. Rpt., 13 (1937), pp. 205, figs. 16*).—This report includes 22 papers dealing with various factors related to the public milk supply.

VETERINARY MEDICINE

The physiology of domestic animals, H. H. Dukes (*Ithaca, N. Y.: Comstock Pub. Co., 1937, 4. ed., rev., pp. XIV+695, figs. 167*).—A thoroughly revised edition (E. S. R., 74, p. 98) in keeping with the recent advances in physiology, with substantial expansions of the text in a number of places. The work includes a chapter on the physicochemical basis of physiological phenomena by E. A. Hewitt, a section on reproduction by G. W. McNutt as revised by S. A. Asdell, and a foreword by H. D. Bergman.

Bacteriology: A text-book of microorganisms, F. W. TANNER *(New York: John Wiley & Sons; London: Chapman & Hall, 1937, 3. ed., pp. XIII+510, figs. [164]).*—A new edition of this work (E. S. R., 60, p. 577).

Bacteriological study of machinists' cutting compound, J. E. FULLER *(Jour. Bact., 34 (1937), No. 2, p. 241).*—Examinations made on three occasions at the Massachusetts Experiment Station of samples of cutting compound from an industrial plant, at intervals of 2 weeks, are reported upon.

"The predominating organisms were members of the *coli-aerogenes* group. All fermented lactose with the production of acid and gas in 24 hr. In their growth on Endo's medium they resembled *Aerobacter aerogenes* rather than *Escherichia coli.* Their reactions to the Voges-Proskauer, methyl red, sodium citrate, and uric tests and indol production were determined. All strains were then classified as intermediates of the group."

This compound consisted of an abrasive in light oil, and water was employed to give it volume. "An examination of the water supply employed indicated that the supply was the source of these organisms. No staphylococci were recovered on either blood agar or nutrient agar plates, which indicated that the numbers of these organisms were relatively small, if they were present at all. Some organisms of the *Bacillus subtilis* group were observed."

[Work in animal pathology by the Montana Station] *(Montana Sta. Rpt. 1936, pp. 34–36).*—This work includes coccidiosis in cattle, dysentery of newborn lambs, black disease and "lunger disease" in sheep, and necrobacillosis.

[Work in animal pathology by the Nevada Station] *(Nevada Sta. Rpt. 1936, pp. 21, 24, 25).*—Reference is made to the work of the year (E. S. R., 76, p. 243) including feeding tests with Labrador tea (*Ledum glandulosum*) and black laurel (*Leucothoe davisiae*), by C. E. Fleming, M. R. Miller, L. R. Vawter, and A. Young; and hemorrhagic disease in cattle, lymphangitis in cattle, and encephalomyelitis in equines, all by E. Records and Vawter.

Diseases of animals: Prevention and treatment, F. C. MINETT *(Jour. Roy. Agr. Soc. England, 97 (1936), pp. 186–209).*—The progress of work (E. S. R., 75, p. 397) with bovine mastitis; Johne's disease; infection of swine, sheep, and horses with *Brucella abortus;* fowl paralysis or lymphomatosis of fowls; and the resistance of animals to worm parasites, by E. L. Taylor, is reported upon.

Annual report of the veterinary department for the year ended 31st December, 1936, W. F. POULTON ET AL. *(Uganda Vet. Dept. Ann. Rpt., 1936, pp. 35, fig. 1, map 1).*—The first part of this report (E. S. R., 77, p. 105) deals with the control of the more important diseases and the *Glossina* investigation and reclamation. The annual report, 1936, of the senior veterinary research officer, Entebbe, by R. W. M. Mettam, presented as appendix 1 (pp. 27–34), relates to research with rinderpest, trypanosomiasis, East Coast fever and turning sickness, tuberculosis, poisonous plants, and rabies.

A check-list of the nematode parasites of the domesticated animals in Burma, J. BHATTACHARJEE *(Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 2, pp. 87–96).*—An annotated check list of the nematode parasites of domesticated animals, chiefly mammals, occurring in Burma, is presented with a list of 18 references to the literature.

A check-list of the trematode and cestode parasites of the domesticated animals in Burma, J. BHATTACHARJEE *(Indian Vet. Jour., 14 (1937), No. 1, pp. 1–10).*—This check list of the trematode and cestode parasites heretofore recorded from Burma, together with five trematode and three cestode parasites not previously recorded, supplements a similar list of nematode parasites above noted. A list of 21 references to the literature is included.

Parasites in slaughter houses in Canton.—II, Nematodes parasitic in the alimentary tract of buffaloes, with a description of two new species, H. T. Chen (*Lingnan Sci. Jour., 16 (1937), No. 2, pp. 157–165, figs. 18; Chin. abs., p. 165*).—A continuation of an earlier contribution (E. S. R., 75, p. 400).

Nematodes parasitic in animals, G. Lapage (*London: Methuen & Co., 1937, pp. X+172*).—The literature dealing with some of the more important aspects of the biology of nematodes parasitic in animals is briefly summarized. The work is presented under the headings of structure, life histories, and classification, physiology, the resistance of the host to nematode infestations, and the control of nematode infestations, with a list of more than 400 references to the literature.

Lechuguilla (Agave lecheguilla) poisoning in sheep, goats, and laboratory animals, F. P. Mathews (*Texas Sta. Bul. 554 (1937), pp. 36, figs. 10*).—A disease of sheep and goats known as "lechuguillaed," "goat fever," or "swellhead," characterized by jaundice, liver and kidney lesions, and at times edematous swellings of the face and ears, which occurs in regions wherever *A. lechoguilla* is found, was investigated cooperatively with the U. S. D. A. Bureau of Animal Industry. In feeding experiments, the details of which are given in tables, the condition was produced by the leaves of this plant and extracts thereof.

"The complete clinical picture of lechuguilla poisoning consists of the combined action of two toxic principles, one a photodynamic agent, the other a hepatonephrotoxin. The photodynamic agent was not identified, but the hepatonephrotoxin was found to have many of the properties of a saponin and was not photodynamic. Mortalities from this disease are principally due to the action of the toxic saponin, especially in relation to the kidney, and not to the photosensitization.

"The toxic principles were extracted from the plant with both water and alcohol, but of the two solvents alcohol proved to be the most satisfactory for the extractions. Hydrolysis of the extract destroyed the toxic saponin but not the photodynamic agent. Rats were found to be susceptible to both toxic principles and [were] in some respects the most satisfactory and economical of the experimental animals. Small doses of the alcoholic extract had a greater photodynamic action on rats than large, toxic, or subtoxic doses. Destruction or neutralization of the toxic saponin resulted in photodynamic action from large doses of the extract. Resistance to photosensitization was observed.

"The activating light for the photodynamic action of lechugnilla poisoning was found to be of greater wave length than 5,328 a. u. Evidence is presented which suggests that light in the region of the sodium lines is the most important. Greater light energy was required to produce the lesions of photosensitization in rats than in sheep or goats. This condition could not be produced in rats earlier than March 21 nor after October 15, but was reproduced in sheep and goats as late as December 10."

A list is given of 46 references to the literature.

The toxicity of orally ingested arsenic, seleninm, tellurium, vanadium, and molybdenum, K. W. Franke and A. L. Moxon (*Jour. Pharmacol. and Expt. Ther., 61 (1937), No. 1, pp. 89–102, figs. 4*).—Continuing the earlier work at the South Dakota Experiment Station (E. S. R., 77, p. 100), in which the toxic elements were injected intraperitoneally, the results obtained from feeding albino rats on these elements at levels of 25 and 50 p. p. m. are reported. Growth curves, food consumption mortality, and hemoglobin levels are shown in charts and tables. The following conclusions were drawn: "The relative toxicity of the elements in the increasing order of their toxicity was as follows:

Arsenic (Na_2HAsO_4), molybdenum ($(NH_4)_6Mo_7O_{24}$), tellurium (Na_2TeO_4 and Na_2TeO_3), vanadium ($NaVO_3$), [and] selenium (Na_2SeO_3 and Na_2SeO_4). At the 50 p. p. m. level arsenic and molybdenum were slightly toxic, tellurium and vanadium were moderately toxic, and selenium was very toxic. Of the five elements considered selenium was the only one which caused a distinct disturbance of the hematopoietic system. The rats receiving tellurium in their diets exhibited a loss of hair (alopecia)." The toxicity of the elements was determined by their effects upon the growth, food consumption, mortality, and hematopoietic system of the animals.

Disinfectants and antiseptics, E. Klarmann (*Soap, 13 (1937), No. 1, pp. 104–108, 121*).—This contribution is presented with a list of 68 references to the literature.

Phenol coefficient of antiseptics? G. F. Reddish (*Soap, 13 (1937), No. 1, pp. 112e–112g, 121, 123*).—The author concludes that "the phenol coefficient test is being misused to the extent that much confusion and misinformation has resulted, and because of this the test itself has been subjected to unjust and unwarranted criticism."

Intravenous use of sodium iodide in actinomycosis, J. Farquharson (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 551–554*).—Sodium iodide administered intravenously is said to have been successfully used in the treatment of actinomycosis and actinobacillosis in Colorado for a period of over 4 yr. The advantages of such treatment are pointed out.

A note on treatment of anaplasmosis, W. H. Boynton, F. W. Wood, and G. M. Woods (*North Amer. Vet., 18 (1937), No. 5, pp. 29, 30*).—A method of treatment for anaplasmosis tried on field cases in California, and which merits further investigation, is briefly reported upon. It consists in the intravenous injection of 1 l of 5-percent dextrose in distilled water to which has been added sufficient sodium cacodylate solution to make a dosage of from 25 to 30 g of the cacodylate per 100-lb. weight of the animal. The cacodylate used was prepared in aqueous solution containing 4.5 g per cubic centimeter, and the required number of cubic centimeters were added immediately before injection. Of 39 cases treated 33 recovered and 6 succumbed, as compared with 96 deaths in untreated cases, in 6 herds.

Rabies (hydrophobia, or "mad-dog"), R. Graham and G. L. Dunlap (*Illinois Sta. Circ. 475 (1937), pp. [24], figs. 7*).—A practical summary of information on this disease, with preventive and control measures.

The prophylactic vaccination of dogs against rabies in a public health program, C. E. De Camp (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 581–587*).—Field evidence is said to have shown that rabies vaccine given to dogs annually as a part of a public health program is of great value in controlling this disease.

On the value and limitations of tissue vaccines against rinderpest, R. L. Cornell and S. A. Evans (*Jour. Compar. Path. and Ther., 50 (1937), No. 2, pp. 122–135, figs. 5*).—Experiments with incubated and formolized glycerin spleen vaccine showed no marked difference in antigenic properties of the two products. Both types of vaccine failed to produce solid immunity in all animals with doses up to 3 g of spleen per 100 kg of body weight. The infectivity of vaccinated animals when reacting to virus and the capacity of vaccinated animals to contract rinderpest by contact are pointed out. The nature and effect of blocked out reactions are discussed, and it is suggested that the difference between those blocked out reactions which result in solid and permanent immunity and those which do not is that virus had established itself and multiplied in the animal's tissues in the former case but failed to do

so in the latter. Accordingly, it appears probable that some animals during the period of the so-called blocked out reaction may also be infective to others. The practical applications of these findings are considered.

Tissue vaccine against rinderpest: A résumé of the literature, G. N. Sreekantiah (*Indian Vet. Jour., 14 (1937), No. 1, pp. 22–27*).—This review of the literature, with details of inoculation and the result of goat spleen vaccine used against rinderpest, is summarized in tables.

[Contributions on Strongyloides ratti in rats], A. J. Sheldon (*Amer. Jour. Hyg., 26 (1937), No. 2, pp. 352–373*).—Further contributions (E. S. R., 77, p. 851) are: The Rate of Loss of Worms (*Strongyloides ratti*) in Rats (pp. 352–354), Age Resistance in Laboratory Rats to Infection With *Strongyloides ratti* (pp. 355–357), and Studies on Routes of Infection of Rats With *Strongyloides ratti* (pp. 358–373).

Obtaining bacteria-free pure lines of Trichomonas foetus by means of microisolation, C. W. Rees (*Amer. Jour. Hyg., 26 (1937), No. 2, pp. 283–291, fig. 1*).—A description is given of an apparatus for microisolation of living cells that has been constructed by the author. With this equipment individual trophozoites of *T. foetus* have been isolated from fluid taken from the vagina of the cow, and the parasites have been transferred to hanging drops on glass strips washed free of bacteria and inoculated into culture medium. Three bacteria-free pure lines of *T. foetus* were thereby established.

Experimental tuberculosis in field-voles and mice, A. S. Griffith (*Vet. Rec., 49 (1937), No. 32, pp. 982–984*).—The author has found that the pathogenic effects in different mice receiving the same dose of tubercle bacilli by the same route are often very diverse. Experiments conducted with field voles have shown that they are highly susceptible to the bovine type and can also be infected with the human type, though apparently with less certainty.

The control of bovine tuberculosis in man, N. Raw (*London: Baillière Tindall & Cox, 1937, pp. VIII+128, pls. 12*).—Chapters on human and bovine tuberculosis, infections of the human caused by bovine bacilli, bovine tuberculosis in children from milk, transmission of tuberculosis from animals to man, immunization of animals and man against tuberculosis, the prevention and treatment of tuberculosis by an immunizing vaccine, tuberculosis in the dog and cat, and a new immunizing vaccine for the prevention and treatment of tuberculosis are included in this work.

A note on the susceptibility of the Syrian hamster Cricetus auratus to Brucella abortus Bang, I. Tchernomoretz and V. Ellenbogen (*Jour. Compar. Path. and Ther., 50 (1937), No. 2, pp. 136–140, fig. 1*).—The observations reported, although limited in number and of a preliminary character, indicate that the Syrian hamster is a very suitable animal for use in investigations of bovine infectious abortion.

Bovine brucellosis, J. McFadyean (*Jour. Compar. Path. and Ther., 50 (1937), No. 2, pp. 69–100*).—A history is given which illustrates the insidious way in which infectious abortion continues to be spread in a herd when diseased and healthy animals are kept on the same premises.

Clinical observations during an outbreak of foot-and-mouth disease in tropical China: The prophylactic value of convalescent serum, C. Weighton (*Vet. Jour., 93 (1937), No. 7, pp. 246–255, pl. 1*).—It was found during an outbreak of foot-and-mouth disease in tropical China that practically all of the calves would die if left unprotected in an attempt to establish a natural immunity. Some 70 calves that were injected subcutaneously with convalescent serum in doses of 50 or 100 cc recovered.

Mastitis, VII–IX (*New York State Sta. Tech. Buls. 244 (1937), pp. 97, figs. 9; 245 (1937), pp. 12; 246 (1937), pp. 25, figs. 3*).—Three contributions are presented in continuation of those previously noted (E. S. R., 78, p. 107).

VII. *The relation of bovine mastitis to milk production*, G. J. Hucker, M. S. Reed, and E. S. Savage.—The investigation reported was planned to secure definite information on the relationship between udder infections and the total amount of milk and milk fat produced. Of the 35 cows that were studied over a period of 4 yr. 15 remained free from infection, 3 were infected throughout the entire course of the investigation, and 17 became infected during the period in which the observations were made. "Weekly quarter samples of foremilk were secured from each cow and examined for presence of mastitis streptococci, the number of leucocytes per cubic centimeter, reaction to bromothymol blue, and the macroscopic appearance of the milk. Daily total milk and milk fat production records also were noted for each cow. Infections of the udder did not affect production as reflected by the persistency in production when the only evidence of infection secured was the presence of mastitis streptococci or more than 500,000 leucocytes per cubic centimeter in the foremilk. No appreciable effect upon production could be found until the infection was sufficiently advanced for the milk to be abnormal in physical appearance. Latent and chronic mastitis when confined to one quarter did not significantly affect production. When such an infection involved three or more quarters significant effects could be noted. The progressive nature of the infection causes it eventually to become sufficiently advanced to affect production. Advanced infections when confined to one quarter did not affect production until the condition became active and the milk was abnormal in appearance. The percentage of milk fat was not affected independently of the total production. Total and milk fat production trends responded similarly to the effects of infection. It was also found that slight infections as evidenced by presence of mastitis streptococci in the foremilk or more than 500,000 leucocytes per cubic centimeter did not affect production materially.

"It is concluded that streptococcic infections of the udder must be sufficiently advanced to make the milk alkaline to bromothymol blue or to show evidences of infection by changes in its physical appearance before a material effect can be noted on production of milk or milk fat."

VIII. *The use of a specially prepared vaccine in an attempt to control bovine mastitis*, G. J. Hucker and P. A. Hansen.—In an investigation of the possible prophylactic and therapeutic action of a vaccine prepared from stock and freshly isolated herd strains of *Streptococcus agalactiae*, 102 animals in 4 herds were studied over a period of 2 yr., 45 being vaccinated and 57 retained as untreated controls. Injections of milk were used in connection with the vaccines. "Weekly quarter samples were secured for 4 to 7 weeks prior to vaccination, and weekly quarter samples for 3 mo. and monthly quarter samples for approximately 14 mo. subsequent to vaccination were examined in the laboratory for presence of mastitis streptococci, number of leucocytes per cubic centimeter, reaction to bromothymol blue, and physical appearance of the milk.

"It is concluded that vaccines prepared from stock and freshly isolated strains of *S. agalactiae* give no evidence of increasing the resistance of dairy cattle to mastitis. Similar vaccines were found to have little or no therapeutic action in the treatment of latent and chronic udder infections. Neither the prophylactic nor therapeutic action of this vaccine was stimulated by the use of simultaneous intramuscular injections of milk."

IX. *The maintenance of a herd free from mastitis*, G. J. Hucker and E. S. Harrison.—A 3-yr. study made of 3 experimental herds, with a total of 271 cows, is reported upon. "Weekly quarter samples of foremilk were examined for presence of mastitis streptococci, number of leucocytes per cubic centimeter, reaction to bromothymol blue, and physical appearance of the milk.

"One of the experimental herds, when the studies were inaugurated, contained no animals which discharged streptococci demonstrable by any of the methods used, another contained a moderate number, while the third contained a large percentage of infected individuals. The herd with the moderate amount of infection was divided into two sections. In one section the cows were milked in order of infection, while in the other no effort was made to isolate or segregate the infected individuals.

Under the conditions studied it was impossible to maintain a herd free from cows which discharged mastitis streptococci in the milk. The percentage of new infections, as evidenced by the appearance of mastitis streptococci in the foremilk, was proportionately decreased as the amount of infection in the herd decreased. In the herd which was relatively free from infection when the studies were inaugurated, only 11 percent of the total cows developed an infection, while 30 percent of the cows in the remaining 2 herds developed an infection as evidenced by mastitis streptococci in the milk. It proved possible to maintain a herd relatively free from cows which produced abnormal milk.

"Thirty-six percent of all heifers from the experimental herds discharged mastitis streptococci in the foremilk during the first week of lactation. The condition of the udder of the dam did not appear to affect the amount of infection in the heifer. A relationship was found, however, between the amount of infection in the parent herd and the incidence of infection in first-calf heifers."

Bovine mastitis, I, II, R. B. Little (*Cornell Vet.*, *27* (*1937*), *No. 3*, *pp. 297–316*, *figs. 2*).—This contribution is presented in two parts.

I. *The significance of the dose factor in the production of experimental mastitis* (pp. 297–308).—In experimental work conducted, the details of which are given in table and graph form, it was shown that in experimental hemolytic streptococcic mastitis 12 quarters of 5 first-calf heifers became infected on a single inoculation with a small amount of 6.5-hr. broth culture. "When a 10^{-2} dilution of a similar culture was used, it required 16 inoculations to produce mastitis in 10 quarters. With a 10^{-3} dilution, 37 inoculations were necessary to induce infection in 7 of 9 quarters, while 2 remained uninfected after 8 and 9 inoculations, respectively. It is evident that the production of experimental mastitis is correlated with the dilution of culture employed."

II. *The production of mastitis by the suction of streptococci into the duct of the teat* (pp. 309–316).—"When a hemolytic streptococcus culture was rubbed over the meatus of the teats of heifers or applied in rubber bags the organisms failed to pass the meatus of the teat. In heifers and cows where attempts were made to introduce streptococci in milk or broth into the udder by suction, the incidence of mastitis was higher in the older cows. The results suggest that the intact duct and sphincter of the teat may act as a natural barrier to the passage of pathogens into the udder."

Studies on bovine mastitis.—XII, Mastitis due to staphylococci, F. C. ~~~ of t~~~ett (*Jour. Compar. Path. and Ther.*, *50* (*1937*), *No. 2*, *pp. 101–121*, *figs. 4*).— natura~~ tinuation of the author's study (E. S. R., 74, p. 853), cases of mastitis, convalesc~~d chronic, due to pathogenic *Staphylococcus aureus* are described and ~~re on the subject is reviewed.

"In its commonest form the disease is chronic, the stroma of the organ being ultimately involved. Enduring infections lead to diffuse induration of the gland, with some decrease in milk yield and qualitative changes in the milk, such as excessive alkalinity, increase in the leucocytes, a lowered specific gravity, and solids-not-fat content. The importance of *S. aureus*, when it inhabits the udder, in part arises from the fact that without a proper bacteriological examination the disturbance it may set up may be confused with that caused by streptococci. In distinguishing pathogenic staphylococci from nonpathogenic types commonly present in normal udder milk, emphasis is laid on the importance of the technic adopted. Plain agar or agar containing horse blood should not be used. Agar containing sheep or ox blood is suitable, especially if the blood is taken from young animals and so contains little or no natural antitoxin, because the toxins produced by *S. aureus* produce characteristic changes on this medium."

A list is given of 33 references to the literature.

The treatment of bovine mastitis with sulfanilamide.—A preliminary report, A. J. ALLOTT (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 588–596*).—The oral treatment of three cases of bovine mastitis due to hemolytic streptococci with sulfanilamide here reported has shown it to be an effective chemotherapeutic agent.

A Rickettsia-like organism of the conjunctival epithelium of cattle, J. D. W. A. COLES (*Jour. So. African Vet. Med. Assoc., 7 (1936), No. 4, pp. 221–225, figs. 8*).—An organism found in the conjunctival epithelium of cattle, which resembles that described in 1931 from sheep (E. S. R., 67, p. 70) under the name *R. conjunctivae* and in 1935 from the goat (E. S. R., 74, p. 254), is described as *R. conjunctivae bovis*.

Paratuberculous enteritis in sheep, J. A. HOWARTH (*Cornell Vet., 27 (1937), No. 3, pp. 223–234*).—This report on Johne's disease in sheep, which has been diagnosed in central California, presents the results of its experimental transmission by repeated drenching with varying amounts of a saline suspension of intestinal scrapings from naturally infected sheep. The strain of *Mycobacterium paratuberculosis* from sheep has been found more difficult to culture than the strain isolated from cattle. "The most pronounced lesions are found in the anterior portion of the small intestine, the cecum, and the posterior portion of the large intestine. The mucosa will not always show the corrugation and irregular folds so characteristic of the disease in cattle. The histopathology, nevertheless, is essentially the same. Attempts to transmit the disease experimentally to cattle and sheep were successful, but failed with guinea pigs, rabbits, and chickens. Infected sheep reacted equally well to johnin or avian tuberculin."

A list is given of 15 references to the literature.

Stomatitis in young lambs involving Actinomyces necrophorus and the virus of contagious ecthyma, H. MARSH and E. A. TUNNICLIFF (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 600–605, figs. 4*).—It is pointed out that the outbreak of stomatitis reported upon in this contribution from the Montana Experiment Station is of interest because of the early age at which the disease appeared in the lambs, and because both the virus of contagious ecthyma and a strain of *A. necrophorus* of relatively low virulence were involved. "Apparently the lesions on the mucosa of the mouth developed as a result of the activity of both *A. necrophorus* and the contagious ecthyma virus. It was possible to reproduce the lesions on the buccal mucosa of lambs experimentally by the inoculation of the unfiltered suspension of material from the mouth lesions, but the filtrates failed to produce lesions on the mucosa,

although they produced characteristic sore-mouth lesions on the lips. Strains of *A. necrophorus* of relatively low invasive power, and with morphological and cultural characteristics similar to those of the strain isolated in this outbreak, have been found in buccal lesions in other cases of virus sore mouth studied."

Some observations on the overwintering of certain helminth parasites of sheep in Canada, H. J. Griffiths (*Canad. Jour. Res., 15 (1937), No. 8, Sect. D, pp. 156–162, fig. 1*).—In the experiments and observations reported the common helminths of sheep *Moniezia expansa, Ostertagia circumcincta, Nematodirus filicollis,* and *Trichostrongylus colubriformis* demonstrated the ability to survive a normal Canadian winter and to cause infestation of sheep when ingested during the following spring. Temperatures during the 4-mo. period ranged from —15° to 52.5° F. It is concluded that pastures cannot be considered free from these helminths after exposure to such temperatures.

Note on an infection of sheep with a Pasteurella-like organism, W. I. B. Beveridge (*Austral. Vet. Jour., 13 (1937), No. 4, pp. 155–157*).—An organism which caused the unexpected death of three 3½-month-old merino lambs during the course of parasitological experiments is said to be more closely related in its biochemical characters to *P. septica* than to *P. pseudotuberculosis.* Its morphology is not typical of that organism and it lacks the pathogenicity for laboratory animals which recently isolated strains of that organism usually possess.

The relation of methods of herding sheep on the open range to the prevalence of grub in the head (Oestrus ovis), S. B. Doten, C. E. Fleming, and L. R. Vawter (*Nevada Sta. Rpt. 1936, p. 25*).—Studies on the value of rotated pastures are briefly referred to.

A preliminary study of the pathogenic effect of Nematodirus spp. in sheep, G. P. Kauzal (*Austral. Vet. Jour., 13 (1937), No. 3, pp. 120–123*).—Experiments reported have confirmed the conclusion of other observers that, in general, the pathogenic effect of *Nematodirus* spp. is quite limited.

Brucellosis of the lamb due to atypical Brucella abortus bovis [trans. title], P. Meurou and M. Pineau (*Bul. Acad. Vét. France, 10 (1937), No. 6, pp. 223–225*).—Observations of an atypical form of bovine infectious abortion occurring in a flock of 150 ewes in the Department of Loir-et-Cher are reported.

Brucellosis of the goat due to Brucella abortus bovis [trans. title], P. Meurou and M. Pineau (*Bul. Acad. Vét. France, 10 (1937), No. 2, pp. 90–93*).—The authors have found that brucellosis due to the bovine type of *B. abortus* may occur in the goat under natural conditions.

Brucella infection (infectious abortion) of swine in the Philippines, T. Topacio (*Philippine Jour. Anim. Indus., 4 (1937), No. 3, pp. 175–187, pls. 3*).—A report is made of two outbreaks of infectious abortion in swine, in which three strains of *B. abortus* organisms having the characteristics of *B. abortus suis* were isolated and identified.

Early research and present-day problems in hog cholera immunization, H. Hell (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 544–550*).—A discussion of hog cholera immunization problems from the viewpoint of the practitioner.

Vaccination of swine against swine erysipelas [trans. title], J. Basset (*Rev. Méd. Vét. [Toulouse], 89 (1937), Feb., pp. 65–81, figs. 4*).—The author has found that the simultaneous administration of serum and virus is simple and harmless and results in a solid and lasting immunity against swine erysipelas.

Studies on the diagnosis of equine strongylosis, with special reference to fecal and blood examinations, J. W. Britton (*Cornell Vet., 27 (1937),*

No. 3, pp. 290–296).—In studies by the California Experiment Station the average percentage of eosinophiles in 27 horses affected with verminous aneurysms was found to be higher than in 10 horses free from the condition. The Stoll method[3] of egg counting was found to be applicable to studies on horse feces. Evidence was obtained which supports the existence of an age resistance to strongyles. A greater tendency toward a variation in egg counts of young horses than in those of old was noted. The average sex ratio of 1,034 specimens of *Strongylus vulgaris* recovered was 3.34 females to every male.

Diseases of the rabbit, O. Seifried (*Die Krankheiten des Kaninchens, mit besonderer berücksichtigung der Infektions- und Invasionskrankheiten.Berlin: Julius Springer, 1937, 2. ed., rev. and enl., pp. IX+254, figs. 91*).—Accounts of the infectious, parasitic, and other diseases of the rabbit are presented, with lists of references to the literature.

Variations in the cells and hemoglobin content in the blood of the normal domestic chicken, C. Olson (*Cornell Vet., 27 (1937), No. 3, pp. 235–263, figs. 6*).—A survey made of the literature, 49 references to which are given, reports of the normal values for cell counts and determinations of hemoglobin in chickens' blood made by the author, the details of which appear in tables, and the seasonal variations of hemoglobin in 733 observations of male and female chicks, graphically illustrated, are presented. Observations on the blood cells included total erythrocyte, leucocyte, and thrombocyte counts and differential counts of the leucocytes.

Diagnosis of poultry diseases, S. H. McNutt (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 532–542*).—A contribution presented at the meeting of the American Veterinary Medical Association at Omaha, Nebr., in August 1937.

The Ohio conference on adult mortality among laying flocks of the Middle West, conclusions by C. M. Ferguson (*U. S. Egg and Poultry Mag., 43 (1937), No. 5, pp. 275, 276*).—A tabulation of the estimated losses of adult fowls, based on the agricultural census of 1935 and records kept by representative poultrymen in cooperation with the extension services in several States, has shown a mortality for 10 States varying from 15.7 percent in Indiana in 1936 to 24.3 percent for the same year in Ohio, with an average of 18.8 percent.

A note on the occurrence of enterohepatitis or "blackhead" in chickens, F. H. S. Roberts (*Austral. Vet. Jour., 13 (1937), No. 4, pp. 158–161, figs. 3*).—In experiments undertaken to ascertain the life cycle and pathogenicity of the cecal worm of fowls (*Heterakis gallinae*), enterohepatitis, of which this worm is a vector, was detected in the majority of the birds examined. This is thought to be the first report of the disease in chickens in Australia, though it has been frequently noted in turkeys.

An undescribed serotype of Salmonella isolated from chicks, E. Jungherr and C. F. Clancy (*Jour. Bact., 34 (1937), No. 2, p. 240*).—Contributing from the [Connecticut] Storrs Experiment Station, the authors report upon four strains of a *Salmonella* organism not conforming to any type in the Kauffmann-White scheme that were isolated from a specimen lot of 15 chicks affected with omphalitis. "The somatic structure was shown to be VI, VII (group C). In H agglutination tests the organism appeared monophasic and showed partial reactions with antiserums of *S. oranienburg* (m t), *S. senftenberg* (g s), *S. enteritidis* (g o m), and *S. derby* (f g). Mirror absorption tests indicated the presence of factors g o m s t of which g o s possessed agglutinating but not complete absorbing power. A phase variation was noted in that colonies con-

[3] Amer. Jour. Hyg., 3 (1923), No. 1, pp. 59–70.

sisting of rods showed, primarily, factors g m t, whereas colonies showing filamentous elements possessed all the specific factors. . . . Accordingly, the present antigenic conception of the chick organism which resembles *S. montevideo* is VI, VII, g o m s t, -, with factors g o s deficient in absorbing capacity."

A blood disease of turkeys, E. P. Johnson and G. W. Underhill (*South. Planter, 98 (1937), No. 9, p. 32*).—In continuation of work at the Virginia Experiment Station with a leucocytozoon disease of turkeys (E. S. R., 77, p. 549), the affection has been found to occur in the Tidewater section. The blood-sucking black (simuliid) flies which transmit the disease were found feeding on turkeys 1 mo. earlier than the preceding year, having first been observed at Grahams Forge on May 13. Management practices recommended have been of some assistance in reducing the loss.

The pathology of Histomonas entero-hepatitis in turkeys and other birds, H. P. Bayon (*Vet. Rec., 49 (1937), No. 33, pp. 1010–1015, fig. 1*).—Presented with a list of 40 references to the literature.

Trichomoniasis (T. columbae) in the Java sparrow, Tovi parrakeet, and Verraux's dove, G. R. Callender and J. S. Simmons (*Amer. Jour. Trop. Med., 17 (1937), No. 4, pp. 579–585, figs. 5*).—Observations in the Canal Zone of natural infections in Java sparrows (*Munia oryzivora*) and artificial infection in the Tovi (Beebee) parakeet (*Brotogeris jugularis* (Müller)) and Verraux's (white belly) dove (*Leptotila* (*verrauxi*) *verrauxi* (Bonaparte)) by a *Trichomonas* believed to be *T. columbae* are described. The pathogenesis of the lesions is reported upon and compared with those due to *Histomonas meleagridis* in the liver of the turkey.

"Three species of birds are added to those previously reported infectible with this parasite. In the material studied the *Trichomonas* appear to spread along natural channels, and in columnar epithelium produce lesions which become secondarily infected by bacteria. These are either carried by the *Trichomonas* or reach the lesions as the result of exposure of the traumatized tissues to the flora of the mouth and pharynx." No evidence was found to indicate that the species studied invaded tissues or that it primarily injured stratified squamous epithelium.

Endoparasitic infestations in grouse, their pathogenicity and correlation with meteoro-topographical conditions, R. V. Boughton (*Minnesota Sta. Tech. Bul. 121 (1937), pp. 50, figs. 16*).—The results of a study of the endoparasitic infestation of 622 grouse (560 ruffed, 62 sharp-tail), of which 546 were from Minnesota and the remaining 76 from Michigan, Wisconsin, and South Dakota, are reported upon. There was an increase in infestation of ruffed grouse from 36.54 percent in 1931–32 to 73.79 in 1933–34 and 59.43 percent in 1934–35. This increase in infestation also follows roughly for the individual species of parasites found.

"No seasonal variation in the degree of parasitism was found to occur. Infestation by species of *Eimeria* was very spasmodic during the different periods of the survey. The maximum infestation (28.87 percent) was found to occur during the period 1934–35. Infestation by *Raillietina tetragona* in young grouse was found to occur in birds as young as 4 days old, and by *Ascaridia galli* in birds 8 days old. *A. galli, Cheilospirura spinosa, R. tetragona,* and species of *Eimeria* may be considered as potentially dangerous parasites of the grouse in Minnesota, although none of the large number of specimens sent in have shown a pathological condition as a result of the parasites. The weight difference between the parasitized and nonparasitized birds has become more pronounced during the last 2 yr., when the total percentage of infestation reached 80 percent. There are so many factors which may play an

important role in determining the weight of a bird that, until further work has been done, it is best that no definite conclusions be made. The writer feels reasonably convinced that the parasites found during this investigation were not responsible for the decline in the adult grouse population recorded in the State during the summer of 1933.

"In the case of the ruffed grouse, a definite correlation between the degree of parasitism and the meteorological and topographical factors appears to occur. Infestation in the different zones outlined appears to depend upon the mean temperature, mean precipitation, soil type, and coverage, the maximum infestation taking place where the mean temperature and precipitation are highest, where the humus content of the surface soil is greatest, and where abundant coverage occurs. The correlation found to exist between parasitism in the ruffed grouse in Minnesota and meteorotopographical factors compares very favorably with the findings of a similar survey by the writer [1932] on the snowshoe rabbit (*Lepus americanus*), carried out in the Province of Manitoba, Canada, during the years 1930–1932 [E. S. R., 69, p. 382].

"In the writer's opinion, none of the parasites found during the present survey (which does not include examinations of adult grouse during the months of June, July, and August) have been directly responsible for the mortality among the adult ruffed grouse during the year 1933–34, when a decrease in the grouse population was reported. . . . That the parasites have played a secondary part in the death of the birds is probable."

The parasites reported upon with their synonyms, hosts, location, morphology, and distribution comprise four species of Cestoda (*Davainea proglottina*, *Raillietina* (*Raillietina*) *tetragona*, *Choanotaenia infundibulum*, and *Rhabdometra nullicollis*), seven of Nematoda (*Ascaridia lineata*, *Heterakis gallinae*, *Subulura strongylina*, *Cheilospirura spinosa*, *Seurocyrnea colini*, *Oxyspirura mansoni*, and *Physaloptera* sp. (larva)), two of Trematoda (*Agamodistomum* sp. and *Harmostomum* (*Harmostomum*) *pellucidum*), and two of Protozoa (*Eimeria dispersa* and *E. angusta*).

A bibliography of three pages is included.

Avian malaria of pigeons, A. B. Coronel (*Philippine Jour. Anim. Indus.*, *4* (*1937*), *No. 3*, *pp. 205–207*).—A brief account is given of observations of adult pigeons in varying stages of pigeon malaria due to *Haemoproteus columbae*.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1936, parts 8, 9, 12 (*U. S. Geol. Survey, Water-Supply Papers 808* (*1937*), *pp. 262, pl. 1; 809* (*1937*), *pp. 187, pl. 1; 812* (*1937*), *pp. 161, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1936, No. 808 covering the western Gulf of Mexico basins, No. 809 the Colorado River Basin, and No. 812 the Pacific slope basins in Washington and upper Columbia River Basin.

Water levels and artesian pressure in observation wells in the United States in 1936, O. E. Meinzer and L. K. Wenzel (*U. S. Geol. Survey, Water-Supply Paper 817* (*1937*), *pp. III+511*).—This report is the second of an annual series on ground water levels and artesian pressure (E. S. R., 76, p. 543). It gives records in observation wells in 28 States and the Territory of Hawaii.

Geology and ground-water resources of Ogden Valley, Utah, R. M. Leggette and G. H. Taylor (*U. S. Geol. Survey, Water-Supply Paper 796–D* (*1937*), *pp. IV+99–161, pls. 6, figs. 11*).—The results of an investigation are reported of the ground water resources of the Ogden Valley, and data are presented on amount and quality.

The waters of Ogden Valley are satisfactory for domestic use and most industrial uses, but some of them are harder than is desirable for certain purposes. Determinations of the fluoride content of samples of water from seven wells indicated that these waters are not likely to be objectionable on this account.

Thermal springs in the United States, N. D. and H. T. STEARNS and G. A. WARING (*U. S. Geol. Survey, Water-Supply Paper 679–B (1937), pp. IV+59–206+IV, pls. 10, figs. 7*).—This publication brings together information relating to the important thermal springs of the United States.

The floods of March 1936.—Part 1, New England rivers (*U. S. Geol. Survey, Water-Supply Paper 798 (1937), pp. X+466, pls. 14, figs. 41*).—This volume presents some of the important facts regarding these and previous floods.

[Irrigation investigations by the Montana Station] (*Montana Sta. Rpt. 1936, pp. 33, 34*).—The progress results of investigations on sources of irrigation water are briefly summarized.

Flow of water through 6-inch pipe bends, D. L. YARNELL (*U. S. Dept. Agr., Tech. Bul. 577 (1937), pp. 118, pls. 2, figs. 103*).—This bulletin presents the results of studies conducted cooperatively by the Bureau of Agricultural Engineering and the University of Iowa. It reports a series of experiments on the flow of water through bends in a 6-in. circular pipe with various amounts of total curvature and including cases with uniform and with nonuniform velocity distribution in the pipe approaching the bend.

It was found that all bends act as obstructions to flow, causing greater loss of head than an equal length of straight pipe. The velocities of the filaments along the inner side of the bend are increased and those along the outer side are decreased from their velocities in the tangent approaching the bend. The loss of head increases with increase in length of the bend, for pipe of equal size, equal radius of curvature, and like material and condition, and is greatest for a bend in which the tangents are joined without an intervening curved section. The ratios of the loss in head caused by the other round-pipe bends to that caused by the 90° standard bend were approximately, for the 45° bend, 0.75; for the 180° continuous-curvature bend, 1.25; for the 180° reverse-curvature bend, 2.1; for the 270° bend, 2.7; and for the miter bend, 7.8.

For a given pipe bend and given quantity of flow, the head loss in the bend is influenced greatly by the velocity distribution in the approach tangent. With velocity in the approach tangent high toward the inner side, the losses of head shown by all the bends ranged from about 1.5 to 4 times that obtained when uniform velocity prevailed in the approach tangent. With the approach velocity high toward the outer side, some bends showed slightly less and some slightly greater losses than obtained with uniform velocity of approach. With high velocity at the top of the approach tangent the loss for each bend was between 1.25 and 2 times that obtained with uniform approach velocity, and with approach velocity high at the bottom the loss was between 1.3 and 3 times that obtained with uniform velocity. These ratios were obtained with a high velocity along one side of the approach tangent about 3 times the low velocity along the other side. From the difference between the pressures on the inner and outer sides of a bend at the point of maximum differences, and having the size of pipe and the radius of curvature of the bend, it is possible to compute the mean velocity and therefore the quantity of flow. When a pipe bend has been calibrated it may be used as a flow meter with which the discharge can be determined by measuring merely the difference in pressure. The losses in the pipe bends experimented upon appear to vary as the square of the velocity, and not as the 2.25 power as suggested by some writers.

Contour-trenches control floods and erosion on range lands, R. W. BAILEY and A. R. CROFT (*U. S. Dept. Agr., Forest Serv., Emergency Conserv. Work, Forestry Pub. No. 4* (1937), *pp. III+22, pls. 10, figs. 6*).—The purpose of this publication is to show the relation of the contour-trench system of flood and erosion control to the broader aspects of upstream engineering applicable to the Intermountain region, to describe the system in detail, and to give instructions for its application in the field, including methods of analyzing problem areas.

Public Roads, [November 1937] (*U. S. Dept. Agr., Public Roads, 18* (*1937*), *No. 9, pp. [2]+169–184+[1], figs. 22*).—This number of this periodical contains data on the current status of various highway projects receiving Federal funds as of October 31, 1937, and the following articles: Channel Changes on Forest Highways, by H. D. Farmer and A. B. Lewellen (pp. 169–175, 182); and Experimental Erosion Control on Forest Highway Fills (pp. 176–182).

Studies on the manufacture of insulating board, O. R. SWEENEY and L. K. ARNOLD (*Iowa Engin. Expt. Sta. Bul. 136* (*1937*), *pp. 75, figs. 30*).—This is a report of studies which were conducted for the purpose of improving existing processes for the manufacture of insulating board from cornstalks and other agricultural byproducts.

Excellent insulating board was made from cornstalk pulp cooked 3 hr. in water at atmospheric pressure. Such board is lighter in color than pressure-cooked pulp board and stronger than mechanical pulp board. The addition of repulped newspapers or other waste paper up to about 20 percent improved the strength of the board. The same result could be secured by adding more highly cooked and refined cornstalk pulp in about the same proportions.

Very good insulating boards were made from cornstalk-straw mixtures, sorghum cane, tobacco stems, artichoke stems, and milkweeds. Boards are being made commercially from wheat straw and cornstalks and have been made from mixtures of straw and cornstalks. The practicability of the use of the other materials is dependent upon their availability in sufficient quantities at reasonable prices rather than on technical difficulties.

The optimum hydrogen-ion concentration for sizing with wax size was pH 4.5, which agrees with results previously obtained with rosin size. The optimum amount of size was shown to be about 6 percent, but even with this amount of size the moisture absorption was higher than that usually obtained with 3 percent rosin size and indicates that wax sizing is not practical for ordinary purposes.

Wax-sized boards dried at 200° C. had higher strength and lower moisture absorption than those dried at 100° or 175°. The lower temperatures are more likely to be used commercially, however, since 200° corresponds to a steam pressure of 210 lb. per square inch. Boards dried at 100° showed greatest strength when dried to 5-percent moisture content.

The improved forming machine operated very well using pulps of varying freeness and produced a board superior in formation to boards from other types of machines. Both the new and the older forming machines produced a board which is not laminated but composed of highly interlaced fibers. When the improved machine was operated at a rate of 4 ft. 8 in. per minute, equally good boards were produced at consistencies of 1.25 and 2.5 percent. At lower speeds stronger boards were produced at lower consistencies.

In forming the board mats on a stationary sheet mold, it was found that little was gained in moisture reduction by exceeding 5 min. in time or 8 in. of mercury vacuum. These results apply to stationary sheet molds, but not necessarily to continuous forming machines.

Increasing the pressure applied to the board prior to drying increased both weight and strength of the board. Stronger and heavier boards can be produced by drying in a press under light pressure than by drying in the regular drier. If the pressure in the press is increased sufficiently a hard type of pressed board having low insulating properties is produced.

Drying was more rapid at 130° than at 120° or 100°. There was a straight-line relation between rate of evaporation and moisture content down to about 60 percent (dry basis). Boards which had once been dried in the normal manner, and then soaked, dried more rapidly than newly formed mats of board.

When boards were dried at ordinary room temperatures on racks, drying was more uniform when the distance between the boards was 1½ rather than ½ or 1 in. Apparently the wider spacing allowed better air circulation. In the heated but not air-conditioned laboratory in the winter, boards on racks dried to satisfactory moisture content in 4 days. While no humidity readings were taken, the humidity under the existing conditions must have been low. The drying time for boards on racks outdoors in summer but protected from the weather was from 10 to 14 days. The drying time for winter outdoor conditions was much longer, very little drying occurring below freezing. All of the boards dried in the heated building warped considerably, probably because of the low humidity; while boards dried outside showed practically no warping. Boards piled with strips of board as spacers sagged between the strips. The most practical method of drying was to place the boards on the wire-covered frames supported upon racks at a 30° angle with the frames 3 in. apart. Except for warping, boards dried on the racks and those dried in the drier were equally satisfactory.

Insulating board dried more slowly in the hydraulic press than pressed board. The results indicate that the rate of drying of insulating board in a hydraulic press can be increased by (1) increasing the temperature of the platens, that is, the drying temperature; (2) increasing the freeness of the pulp, that is, using less hydrated pulp; (3) increasing the pressure on the board; and (4) heating the pulp or the cornstalks used for the pulp above 125° while dry before the final refining and board formation.

The infiltration through cornstalk insulating board may be reduced by increasing the paper content, by increasing the density, or by applying a surface coating of paper pulp. A board practically impervious to infiltration can be produced by the use of the paper coating.

Studies on the dusting of cornstalk insulating board showed that (1) the use of a fine mesh top wire (such as 40-mesh) or a felt on the press rolls will reduce dusting on the top surface of the board, and (2) coating the surface of the board with paper pulp or spraying with a solution of tung oil in kerosene or with sodium silicate reduced dusting. These materials were more effective when applied to the wet board mat as it comes from the press rolls than when applied to the dry board.

Cornstalk acoustical board, L. K. Arnold, H. J. Plagge, and D. E. Anderson (*Iowa Engin. Expt. Sta. Bul. 137 (1937), pp. 47, figs. 19*).—This report describes apparatus for the automatic determination of reverberation time, together with a method of operation, which is believed to be rapid and accurate. Studies are reported on the effect of composition and surface treatment upon the coefficient of sound absorption of cornstalk acoustical board and upon the effectiveness of the board when installed on the underside of chairs and tables.

Cornstalk acoustical board made from mechanical pulp had a greater sound absorption than board made under similar conditions from steamed pulp.

Paper pulp added to cornstalk acoustical board made either from mechanical or steamed pulp reduced the coefficient of sound absorption. Up to a certain point, depending upon the absorptiveness of the basic board and the size of the grooves, the addition of grooves increased the sound absorption in proportion to the number of grooves added. Effective acoustical board was made by surfacing soft cornstalk insulating board with cornstalk pressed board in which holes were drilled. The absorption increased in proportion to the number of ¼-in. holes added, up to 225 holes per square foot. Certain hollow types of cornstalk board were more effective acoustically for the amount of material used than solid boards. Cornstalk acoustical board when attached to the underside of table tops and chair seats up to the amount applicable under practical conditions was only slightly less efficient than when tested under standard conditions.

Using the tractor efficiently, A. W. CLYDE (*Pennsylvania Sta. Bul. 343 (1937), pp. 20, figs. 14*).—This bulletin is a summary of information on the subject from various sources, including the results of work conducted at the station. It presents practical suggestions on how best to use the tractor in the various draft operations.

It is pointed out that a two-plow tractor in order to be profitable should replace at least two horses and be used more than 300 hr. per year. Other factors discussed are oils, fuels, and factors involved in traction. Special attention is devoted to hitches.

Farm implements and machinery, S. J. WRIGHT (*Jour. Roy. Agr. Soc. England, 97 (1936), pp. 210–236*).—This analytical review, prepared by the Institute for Research in Agricultural Engineering of the University of Oxford, relates to power farming, tractors, cultivating implements, harvesting, grass conservation, and the use of electricity in farming.

Some variables in experimental seeders, G. P. MCROSTIE ET AL. (*Sci. Agr., 17 (1937), No. 8, pp. 523–528, figs. 3; Fr. abs., p. 528*).—Experiments are reported which were conducted at the University of Manitoba with four types of hand seeders, of which two were common commercial types and two were models developed for experimental seeding.

In general, the new continuous belt seeder proved to be the most satisfactory for the seeding of either head rows or rod rows of wheat. There was a definite influence of speed of operation on the amount of seed delivered in the case of the Planet Junior seeder. The slower speed in all cases resulted in a larger delivery of seed, and no significant influence was secured by varying the amount of seed in the hopper. With the Columbia seeder the reverse condition was encountered. The speed of operation had no significant influence on the quantity of seed delivered, but increasing the amount of seed in the hopper resulted in apparently significant increases. None of the seeders tested were as satisfactory in seeding oats or barley as they were in the case of wheat.

Machine placement of fertilizer for cotton, H. P. SMITH, H. F. MORRIS, and M. H. BYROM (*Texas Sta. Bul. 548 (1937), pp. 52, figs. 23*).—This bulletin reports investigations which were conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, the National Fertilizer Association, and the Joint Committee on Fertilizer Application. It is pointed out that the placement of fertilizer in relation to the cottonseed at the time of planting has a profound influence on the germination of the seed. Experiments were made at Bryan, Temple, College Station, and Nacogdoches, Tex., from 1932 to 1935.

Of all placements of fertilizer the best germination of cottonseed and the highest yields were obtained when the fertilizer was placed to the sides and below the seed level. The location of the fertilizer in relation to the seed affected germination more than it did yield. When the fertilizer was placed within 1 in. of the seed, germination was injured.

More plants were obtained where one-fourth of the fertilizer was applied in the surface soil over the seed and the balance 2½ in. to each side and 2 in. below the seed level, but a higher yield was obtained where one-eighth of the fertilizer was applied with the seed and the balance 3½ in. to each side and 2 in. below the seed level.

When results of applying fertilizer in both wide and narrow bands directly under the seed were compared, the 3-in. depth gave the highest number of seedlings for both width bands, but the 2-in. depth gave the highest yield for the narrow bands and the 1-in. depth for the wide bands.

For 250-, 500-, and 750-lb. rates, the 500-lb. rate applied in bands 2½ in. to each side and 2 in. below the seed level gave the largest number of plants, but the 750-lb. rate applied 3½ in. to each side and 2 in. below the seed level gave the highest yield.

Where all of the fertilizer was placed on one side of the seed the highest yield of 326 lb. of lint per acre was obtained, as compared with 312 lb. for a divided placement with equal amounts on each side. Two unfertilized checks yielded 239 and 257 lb. of lint per acre, and the results show a significant increase from the use of fertilizer for both the one-side and the each-side placements when all four locations are considered. Better response from the use of fertilizer was obtained at College Station and Nacogdoches than at Bryan in the Brazos River bottoms and at Temple.

Disturbing the soil at any depth under the seed without applying fertilizer reduced the final stand of plants as compared with the stand obtained where the soil was undisturbed for a distance of 2½ and 3½ in. to each side of the row and no fertilizer applied.

Plans of farm buildings for Northeastern States (*U. S. Dept. Agr., Misc. Pub. 278 (1937), pp. 128, figs. 118*).—These plans of farm buildings and equipment have been compiled by the Bureau of Agricultural Engineering and the Extension Service in cooperation with the Connecticut, Massachusetts, Pennsylvania, and Rhode Island State Colleges; and the Universities of Delaware, Maine, Maryland, New Hampshire, Vermont, and West Virginia, Rutgers University, and Cornell University.

Modern electric and gas refrigeration, A. D. ALTHOUSE and G. H. TURNQUIST (*Chicago: Goodheart-Willcox Co., 1936, 2. ed., pp. [10]+858, figs. 368*).—This, the second edition of this handbook (E. S. R., 71, p. 894), has been greatly enlarged. It now contains chapters on fundamentals of refrigeration, the compression system, the absorption system, conventional domestic compression cycle refrigerators, domestic rotary and hermetic compression cycle refrigerators, domestic absorption refrigerators, domestic automatic controls, domestic refrigerator electric motors and gas supply, domestic refrigerator cabinets, domestic refrigerator installations, domestic refrigerator servicing, service tools and the refrigerator service shop, commercial refrigeration cabinets and mechanisms, commercial refrigeration calculations and heat loads, commercial refrigeration installation and servicing, refrigerants, technical characteristics, air conditioning, domestic refrigerator specifications, school refrigeration laboratory projects, and answers to review questions.

Camp stoves and fireplaces, A. D. TAYLOR (*U. S. Dept. Agr., Forest Serv., Emergency Conserv. Work, 1937, pp. [9]+91, pls. 27*).—This publication contains a large amount of practical information on the subject.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Montana Station, 1935–36] (*Montana Sta. Rpt. 1936, pp. 7–13, figs. 2*).—Included are some findings as to (1) the average size of farm units and gross income, 1928–35, on grain and combination grain and livestock farms in 17 counties fairly representative of the dry farm area of the State; (2) the value of different grades of grazing lands and of productivity values of different grades of dry farm crop lands; and (3) the relationships between assessed value and productivity value for different grades of farm and grazing land.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 188 (1937), pp. 153, 154*).—In an article entitled Parity Prices for Ohio Farm Products, by J. I. Falconer, a table shows for 16 farm products the prices for June 1937, the June parity price (33 percent above the average prices, 1910–14), and the percentages the actual prices were above or below parity. The percentages above parity were corn 34, potatoes 9, hogs 14, beef cattle 9, lambs 20, and wool 25. Those below parity were wheat 15, oats 17, hay 44, veal calves 12, sheep 31, eggs 28, chickens 4, milk cows 20, and horses 37. Butterfat was at parity. The table of index numbers of production, prices, and income (E. S. R., 77, p. 867) is brought down through July 1937.

Current Farm Economics, [October 1937] (*Oklahoma Sta., Cur. Farm Econ., 10 (1937), No. 5, pp. 87–107, figs. 2*).—The usual tables of index numbers of prices in the United States and Oklahoma and demand deposits in Oklahoma and of price and purchasing power of Oklahoma farm products are brought down through September 1937. Articles are included on the Wheat Situation, by A. L. Larson (pp. 89, 90); Cotton Loan and Price Adjustment Payments (pp. 90–93) and What Policy for Cotton Production and Price Control? (pp. 96–99), both by T. R. Hedges; Cotton Quality Improvement Program Under Way, by K. C. Davis (pp. 93–96); and What Attitude Should Public Education Take Toward the Cooperative Movement? by F. W. Peck (pp. 99–103). An excerpt from the article on Some Economic Aspects of the Price Paid to Producers for Butterfat in Oklahoma 1926 to 1935, Inclusive, previously noted (E. S. R., 77, p. 867), with an additional chart showing the average monthly farm prices of butterfat in the United States and Oklahoma, 1926–35, is also included.

[Investigations in agricultural economics by the Puerto Rico College Station, 1935–36], J. E. McCord (*Puerto Rico Col. Sta. Rpt. 1936, pp. 67–71*).—In addition to brief summarizations of findings previously noted in studies on small farms, the credit situation, and coffee farms, a preliminary summary is included of the average production, receipts, expenses, labor income, etc., on 166 colonos farms (individual sugarcane farms).

Regional planning.—I, III, National Resources Committee (*Washington: Govt., 1936, pts. 1, pp. XXIV+192 [pl. 1], figs. 56; 3, pp. [XII]+101, figs. [103]*).—Included in part 1 are the recommendations of the National Resources Committee, the report of the Pacific Northwest Regional Planning Commission, and staff reports of the commission on the study of the Columbia River Basin. Part 3 includes the recommendations of the committee and the reports of the New England Regional Planning Commission, and of the staff on population, land resources, recreation, water resources, transportation, industry, publicity, and planning agencies in New England.

Graphic survey: A first step in State planning for Vermont (*[Montpelier]: Vt. State Planning Bd., 1935, pp. [7]+XV+58, [figs. 36]*).—This report to the Vermont State Planning Board and National Resources Board includes

maps and charts showing the historical development; geographic, physiographic, and climatic features; soil productivity; land use and ownership; roads; population distribution; employment, income, and wealth; industrial distribution; agricultural regions; value of agricultural products; farm facilities and equipment; size of farms; farm tenure; debt and costs; data as to relief; State forests and parks; education; medical facilities; State expenditures; etc.

State planning, Vermont, 1936 (*Montpelier: Vt. State Planning Bd., 1936, pp. 84, [figs. 59]*).—The data in the report noted above are amplified and revised, and graphs are included showing data obtained from special studies of welfare and State finance.

First biennial report of the South Dakota State Planning Board (*S. Dak. State Planning Bd. Bien. Rpt., 1 (1935–36), pp. [3]+XIII+145, figs. 3*).—Included are the reports and recommendations to the State legislature, Federal Government, and county planning boards on land use, tenancy, range lands, weed and insect pest control, soil conservation, agricultural statistics, marketing, education, taxation, tax delinquency, public milk supplies, water supplies, rural recreation, and other subjects pertaining directly to agriculture, and also subjects pertaining to hydroelectric power, navigation, State institutions for physical and mental defectives, Indians, public health, mining, public parks, State forests, public works, etc. Also are included the reports of the board to the Emergency Drought Conference called by the Central Northwest Regional Planning Commission at Rapid City, S. Dak., August 21 and 22, 1936; the general recommendations of the commission made to President Roosevelt's Great Plains Drought Area Committee on a permanent program of restoration for the drought area; and lists of the members of the standing committees of the committee planning boards in the State.

The future of the Great Plains: Report of the Great Plains Committee (*Washington: Govt., 1936, pp. [8]+194, [pls. 15], figs. [32]*).—This is the report of the committee appointed by President F. D. Roosevelt in September 1936 to suggest "a long term program for the efficient utilization of the resources of the Great Plains area." The physical characteristics of the area, its population and settlement, the undesirable tendencies in land use and tenure and the destructive effects thereof, and the attitudes of mind of the people, and a program of readjustment and development through Federal, State, and local actions and farm organization and practices are discussed. Ways to institutional readjustment are set forth in memorandums on capital and credit; taxation; legal problems, including soil erosion control, acquisition and development of submarginal lands, acquisition and administration of tax-delinquent lands, grazing control, rural zoning, farm tenancy, and water utilization; and education for conservation. Appendixes include the President's letter of instructions to the committee; articles on Soil and Water Conservation in the Great Plains—Typical Results of Operations Program, by the U. S. D. A. Soil Conservation Service (pp. 133–143), and on the Benefits Derived by Areas Surrounding Irrigation Projects, by the Bureau of Reclamation, U. S. Department of the Interior (pp. 144, 145); a report of a land use study in Fergus County, Mont., by R. B. Haight; an excerpt, entitled A Montana Cooperative Grazing Association, from a bulletin previously noted (E. S. R., 76, p. 412); a standard State soil conservation districts law; summaries of Texas legislation on soil erosion control, of the New York and Wisconsin plans for developing and preserving State forest land, and of the Taylor Grazing Act; Montana grazing laws of 1935; New Mexico legislation relating to underground water; uniform underground water law for Western States suggested by a committee of the Western State Engineers' Association; and a brief bibliography.

Farm records, J. A. Hopkins (*Ames, Iowa: Collegiate Press, Inc., 1936, pp. XVII+219, figs. 15*).—Part 1, the organization of the farm business (pp. 1-42), deals with the farm budget, production records, farm inventory, and the net worth statement; part 2, financial accounts (pp. 45-69), discusses the more common forms of accounts kept on farms; part 3, analysis of the farm records (pp. 73-124), discusses the presentation of the facts of income, suggests ways the records may be used currently, describes the preliminary analysis of the combined financial and statistical records, and suggests more accurate interpretations of the measures of performance and some of the many interrelationships between the various parts of the farm business; part 4, some special problems (pp. 127-165), deals with perennial crops, orchards, personal, partnership, stock share partnership, and outside investment accounts, accounts for landlords, valuation of inventories, and depreciation; and part 5, physical records and enterprise analysis (pp. 169-211), deals with feed and labor accounts, the analysis of enterprises, and the use of accounting data in budgetary control.

Some records of farmers in North Dakota, I-III, C. E. Miller (*N. Dak. Agr. Col., Dept. Agr. Econ., 1936, pp. [2]+14, figs. 5*).—The tables and charts included are based on data collected in cooperation with the North Dakota Extension Service and the Works Progress Administration. Part 1 deals with crop yields on an individual Cass County farm, 1907-35; part 2 with labor incomes, 1915-35, on two Ward County farms; and part 3 with incomes, expenses, cost of living, and other items on a number of Morton County farms, 1933-35.

Ontario agricultural outlook report, 1937 (*[Toronto]: Min. Agr. [1937], pp. 48, figs. 7*).—The outlooks for different field crops, different kinds of livestock and livestock products, fruits, vegetables, poultry products and other agricultural products, and the trends of prices of farm products and manufactured products, employment, and exports of farm products are discussed.

[Profitableness of farming in Scotland] (*Scot. Dept. Agr., Rpt. Profitableness of Farming, 5 (1932-33), pp. [1]+65; 6 (1933-34), pp. [6]+63; abs. in Internatl. Rev. Agr. [Roma], 27 (1936), No. 12, pp. 369E-381E*).—These are the fifth and sixth reports of the series previously noted (E. S. R., 73, p. 404). An analysis is made of 206 farm accounts relating to the year 1932-33 in the fifth report and of 239 accounts for the year 1933-34 in the sixth report.

Land utilization and rural economy in Korea, H. K. Lee (*Chicago: Univ. Chicago Press; Shanghai: Kelly & Walsh, 1936, pp. XII+302, figs. 12*).—The findings in a study in 1931-32 are discussed in chapters on the general conditions bearing on land utilization and rural economy; characteristics of Chosen (Korean) agriculture; land utilization; land ownership and tenancy; the utilization of forest, urban, and mineral land; capital investments other than in land; farm labor; rural credit; marketing and prices of farm products; farm income and expenses; the standard of living; and agricultural colonization.

A report on land ownership in South Dakota (*Brookings: S. Dak. State Planning Bd., 1936, pp. [85], figs. 72*).—The ownership classes and patterns in the State, as of March 1, 1934, are discussed and maps included showing the size and location of holdings under different types of ownership in the various counties in the State.

Farm tenancy in North Carolina, 1880-1935, R. M. Williams and O. Wakefield (*North Carolina Sta., AE-RS Inform. Ser. No. 1 (1937), pp. [2]+66, pl. 1, figs. 31*).—This is a synthesis of available information on the subject,

Costs of producing hops in Oregon during 1935, G. W. Kuhlman (*Pacific Hop Grower, 4 (1937), No. 10 [11], pp. 4, 5*).—This article, based on work of the Oregon Experiment Station., analyzes investment, yield, costs, and the effects of yields and size of hop yards on costs of 79 yards with 3,830 acres of hops.

The total cost of production averaged 16.6 ct. per pound, ranging from 12.37 ct. for the 20 low-cost farms to 20.18 ct. for the 20 high-cost farms. Thirty-eight farms had costs below 15 ct. and 11 over 20 ct. Average costs decreased from 21.8 ct. for the farms with yields of less than 600 lb. per acre to 15.0 ct. for those with yields over 1,000 lb. per acre.

Factors influencing the cost of production of eggs and pullets in southern Arizona, H. Embleton and H. C. Morse, rev. by H. Embleton (*Arizona Sta. Bul. 158 (1937), pp. 141–168, figs. 5*).—This is a revision of Bulletin 145, previously noted (E. S. R., 70, p. 266). A few tables and some comparable data from other State experiment stations have been added, and a few new computations made.

North Park cattle production: An economic study, R. T. Burdick and M. Reinholt (*Colorado Sta. Bul. 435 (1937), pp. 87, figs. 10*).—This study made in cooperation with the Bureaus of Agricultural Economics and Animal Industry, U. S. D. A., covers the 3 yr. 1929–31, inclusive. The data analyzed were secured for 18 ranches representative of medium- and large-sized ranches, with part of their areas owned and part leased. Eight of the ranches were included in the study made in 1922–25 (E. S. R., 60, p. 483), and some comparison of the findings for these ranches is made. The data in the present study were obtained from record books kept by the cooperating ranches and monthly check-up visits. Purchase and sales records were secured from commission-house statements.

The soil, climate, landownership, etc., of the area are described. The ownership and size of the ranches, improvements and equipment, labor, financial organization and income, and the receipts, expenses, and cash available for family living are analyzed and discussed. The problems of size of ranch, ranch organization, use and cost of national forest grazing, and of cattle prices and marketing are discussed. An analysis is made of the practices and effects on organization, costs and income of winter feeding, calf production, cattle losses, pounds of beef produced, expenses per head of cattle and for different classes of cattle, hay production, etc. Two selected ranches are analyzed and suggestions made for reorganization. On the basis of the data obtained, budgets were calculated indicating sales and expenses on theoretical ranches organized to sell their surplus cattle as (1) calves, except replacement heifers, (2) yearling steers and excess yearling heifers, (3) 2-year-old steers and excess 2-year-old heifers, (4) calves and fat cows, (5) yearling steers and fat cows, and (6) 2-year-old steers and fat cows. These budgets showed the fat-cow combinations to be the best. Where surplus cattle were sold as growing cattle rather than fat cows the calf budget was best.

Joint report of the special committee on the turkey industry (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+28*).—This report presents the findings in a survey made by a committee composed of representatives of the U. S. D. A. Bureaus of Agricultural Economics, Animal Industry, and Home Economics, Agricultural Adjustment Administration, and Extension Service, and the U. S. Farm Credit Administration. Production trends and shifts, factors responsible for expansion in production, production credit, costs of production, marketing, cooperative turkey marketing associations, possibilities of a marketing agreement, the expansion of the demand for turkeys, present

information services of the Bureau of Agricultural Economics, needed additional types of information, etc., are discussed.

Economic problems affecting turkey marketing in California, J. M. Tinley and E. C. Voorhies (*California Sta. Bul. 612 (1937), pp. 78, figs. 17*).—Data are assembled and analyzed regarding turkey production in the United States and California—the changes in numbers produced, geographical shifts in numbers, the relation of shifts in numbers to human population, and the production of all types of poultry. The methods of marketing turkeys in the United States and in the San Francisco and Los Angeles markets and the methods whereby prices of turkeys and other poultry are determined and made public are discussed. The turkey production trend in relation to trend of human population and changes in buying power and consumption habits are discussed in relation to their effects on turkey prices in the United States. An analysis is made of the regional trends, annual changes, and seasonal variations in farm prices of turkeys, and of the seasonal variations of prices of turkeys in the wholesale markets in Los Angeles, San Francisco, and New York City. The cold storage holdings of turkeys and chickens and marketing costs and margins are discussed. Some of the findings and conclusions follow.

The number of turkeys on farms in the United States decreased from 10,754,000 in 1890 to 3,627,000 in 1920, then increased to 5,382,000 by 1935, while the human population from 1890 to 1935 about doubled. In 1935 the Mountain States had over 8 times and the Pacific States nearly 2½ times as many turkeys as in 1890. The average number of turkeys per 100 population in 1929 was 13.8 for the United States as a whole, 26.2 in the three Pacific States, and 22.6 in California, but the per capita consumption of turkey meat in the Western States is approximately twice as high as the United States average. In 1920 the North Atlantic States produced about 17 percent of their requirements of turkeys, the North Central States about 58 percent, the Western States about 70, and the west North Central, South Central, and South Atlantic States approximately 100 percent. By 1935 the deficit position of the North Atlantic, South Atlantic, and east North Central States was greatly accentuated, but in the Mountain States nearly one-third of the turkeys were surplus and the Pacific States had a small surplus. From 1920 to 1929 farm prices of turkeys averaged nearly 100 percent higher than during the period 1910–14, while the index of all farm products averaged only 50 percent higher. During the depression, farm prices of turkeys declined more rapidly than the prices of all farm products, but since 1933 turkey prices have shown the greater degree of recovery. Annual production of turkeys, together with the level of consumer buying power, appears to be the most important factor influencing the annual level of turkey prices. Higher prices for chickens, beef, pork, lamb, and other meats appear to have been a strengthening factor in turkey prices. During the period 1933–35 farm prices of turkeys in the Western States averaged about 10 percent lower than 1912–15 while in other geographic divisions the average was about 10 percent higher. Farm prices of turkeys showed no pronounced seasonal movement, largely because of there being two distinct marketing periods. The first and most important runs from October to January or February, during which time the bulk of young birds are sold, and the second from March or April to June, during which period breeder hens are sold. Due to the poor quality of birds during the later period, prices are usually several cents per pound lower than during the first period. Cold storage holdings show a pronounced seasonal variation, with the peak in February or March and the low point in November. Since 1925 the trend in the peak storage holdings in February or March has been pronouncedly upward, while that of low holdings in November has been less pronouncedly downward. No very

close correlation between storage holdings and seasonal prices of turkeys was found. In addition to the establishment of better facilities to make available reliable information as to supplies and prices of turkeys in the Los Angeles market, the conclusion is reached that the producers of turkeys in southern California would strengthen their bargaining position by killing, dressing, and grading turkeys at country plants and by establishing, or selling their dressed turkeys through, a cooperative sales agency in Los Angeles.

The economics of imperfect competition, J. ROBINSON (*London: Macmillan & Co., 1933, pp. XII+352, figs. 82*).—"The main theme of this book is the analysis of value." The subject is discussed in parts on technic; monopoly equilibrium; competitive equilibrium; the comparison of monopoly and competitive output; price discrimination, dealing with the case of a single firm selling the same commodity at different prices; monopsony; the demand for a factor of production, the factor used being labor; the comparison of monopoly and competitive demand for labor; exploitation, dealing with monopolistic and monopsonistic exploitations of labor; and a world of monopolies, in which it is shown how the analysis can be linked up with A. C. Pigou's[4] work on the economics of welfare. An appendix discusses the application of the results of analysis to increasing and diminishing returns.

The controlled distribution of a crop among independent markets, F. V. WAUGH, E. L. BURTIS, and A. F. WOLF (*Quart. Jour. Econ., 51 (1936), No. 1, pp. 1–41, figs. 10*).—This paper is "concerned primarily with the marketing of agricultural crops, where a typical situation is that the growers or their organization have at the beginning of the marketing season a definite quantity, all of which they are to sell in a definite period of time. The problem is to find what proportion of a fixed total to sell in each individual market in order to get the greatest possible net income for the crop." It deals with the application of the general principles of discriminative prices discussed by J. Robinson, noted above, to the marketing of a number of agricultural crops. The principle of equal marginal net returns from all markets, even or uneven production or sales from year to year, allocation of supplies between two markets and among several independent markets, the practicability of the principle of equalizing marginal returns, discriminative marketing and the consumer, and the mathematical development of the conditions of maximum returns are discussed.

Speculation and the carryover, J. B. WILLIAMS (*Quart. Jour. Econ., 50 (1936), No. 3, pp. 436–455, figs. 6*).—This is a mathematical analysis of the effects of speculation upon the supply and the demand for a commodity.

Windfall tax and processing tax refund provisions of the 1936 Revenue Act, W. F. FERGER (*Amer. Econ. Rev., 27 (1937), No. 1, pp. 45–60, figs. 3*).—"The background of these provisions is explained, and the nature of the economic proof required is outlined and analyzed in its relation to economic theory and to the experience of the processing industries concerned."

Problems of the cotton economy: Proceedings of the Southern Social Science Research Conference, New Orleans, March 8 and 9, 1935 (*Dallas, Tex.: South. Region. Com., Social Sci. Res. Council, 1936, pp. [VIII]+86, [fig. 1]*).—These proceedings include a paper by J. T. Sanders, with remarks by T. J. Cauley, on cotton in world affairs, which deals with the research needed, cotton and foreign affairs, and future research problems; one by R. B. Vance, with remarks by C. A. Wiley and C. S. Johnson, on cotton and tenancy, which deals with the concepts, definitions, issues, materials, technics, and interpretations

[4] The Economics of Welfare. London: Macmillan & Co., 1920, pp. XXXVI+976, figs. [16].

in research on the problems, and makes comparisons with the British policy in Ireland; one by H. W. Odum, with remarks by M. D. Anderson, on cotton and diversification, dealing with methodology, implications, definition, and characteristics of the problem, areas of research, problems of research, etc.; and one by H. C. Nixon, with remarks by M. Evans, on cotton and southern politics. The report of the special committee deals with the organization for research and research projects and methods.

Sales of cotton for future delivery, 1925–26 to 1935–36, R. E. Betts (*U. S. Dept. Agr., Misc. Pub. 282 (1937), pp. 42, figs. 13*).—Tables and charts show for the New York and the New Orleans Cotton Exchanges for the period August 1925–July 1936 by crop years (August 1 to July 31) the total volume of sales (exclusive of transactions exempt from tax) of cotton-futures contracts; the number of contracts sold for delivery in each active futures month and number and percentage of such contracts reported settled by actual delivery of certified cotton; and other related data. One table shows the number of futures contracts on the Chicago Board of Trade by months, January 1929–July 1936.

Farmers' grain elevators and warehouses in the Pacific Northwest, intermountain States, and western Montana, 1934–35, H. E. Ratcliffe (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Misc. Rpt. 8 (1936), pp. 17, pl. 1*).—This study was made in cooperation with the grain cooperatives and the State extension services and experiment stations of Oregon, Washington, Idaho, Utah, and Montana. Data were obtained regarding 68 of the 103 local farmers' elevators and warehouse associations, 21 intermountain cooperative grain marketing associations in southern Idaho and northern Utah, and 13 cooperative grain associations in western Montana. The report applies particularly to the North Pacific associations.

Net returns were obtained by 94 percent of the associations handling over 300,000 bu. of grain, by 78 percent of those handling from 150,000 to 300,000 bu., and by only 50 percent of those handling less than 150,000 bu. The chance for net income was 60 percent greater in associations having 75 or more members than in smaller associations. About 75 percent of the members patronized their associations and furnished 75 percent of the grain. Net income was obtained by only two-thirds of the associations whose members had less than 50 percent equity in their associations, as compared with 85 percent in the associations with member equities of over 50 percent. Average current assets consisted of 15.4 percent cash, 44.6 receivables, 16 inventory, and 24 percent other items. Chances for operation losses were substantially reduced where the cash exceeded 12 percent and receivables were less than 30 percent. Net incomes were had by all the associations where storage charges were 2.25 ct. per bushel or less but by only two-thirds of the associations where such charges were higher. Side line business was relatively unimportant and margins small.

The international grain trade, A. A. Hooker (*London: Isaac Pitman & Sons, 1936, pp. X+144,* [*figs. 3*]).—"The present volume describes the trade from its London aspect, since London remains the largest distributional center for international grain, and it is written principally for the market clerk who is anxious to improve his knowledge of the trade and acquire a wider and more balanced view of the world's grain business." It is divided into two parts—distribution in space and distribution in time and uncertainty bearing.

Philadelphia wholesale fruit and vegetable markets, R. B. Donaldson (*Pennsylvania Sta. Bul. 349 (1937), pp. 56, figs. 11*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the

New Jersey State College of Agriculture. It is based on the following records obtained from September 1935 to July 1936: Distribution records from 50 dealers in the Dock Street market and 25 from the Callowhill Street market, one of the principal chain stores, and the Philadelphia Terminals Auction Company; interviews with 89 growers in 10 Pennsylvania counties, with 112 out-of-town buyers, with 85 retailers in Philadelphia and 15 in Camden, and with 94 drivers of trucks from 11 States bringing produce to the Dock Street market; traffic data on the Dock Street market; and conferences with committees and representatives of the Philadelphia produce trade.

The present status of the markets is analyzed, with particular reference to existing physical facilities and the shift in importance of the various markets due to changing methods of transportation. The status and possibilities of Philadelphia as a receiving market for Pennsylvania-grown products and as a distributing market to secondary cities of the State are discussed and suggestions made for improvements in the physical facilities, organization, operations, etc., of the Philadelphia markets.

One of the greatest needs pointed out is coordination among the five markets, which are now set up on the arbitrary basis of whether produce arrives by rail, boat, or motortruck. This results in too many markets attempting to perform the same functions.

"The development of direct purchases and transportation by motortruck from producing areas are a challenge to the fruit and vegetable interests of the Philadelphia market. This has been a development of the past decade. The rapidity of the movement will depend to a great extent upon comparative costs. So long as buyers in smaller cities can purchase and transport by truck direct from producing areas more cheaply and more efficiently than they can purchase in the Philadelphia market, the present tendency to avoid the Philadelphia market is likely to increase."

Farmers' cooperative marketing and purchasing associations in Missouri, E. G. Schiffman and H. M. Haag (*Missouri Sta. Bul. 389 (1937), pp. 71, figs. 6*).—This bulletin is devoted chiefly to a description and discussion of the organization and operation of exchanges and elevators. Data were obtained for the year 1935 or as of December 31, 1935, chiefly by means of a survey schedule filled out from the financial records of associations and from replies to questions asked managers. Such records were obtained from 273 exchanges and elevators, 21 livestock shipping associations, 8 creameries, 24 fruit associations, and 6 miscellaneous associations. Limited information regarding 61 other associations including 26 exchanges and elevators was obtained by a mail questionnaire.

The data on exchanges and elevators are analyzed and discussed under the headings of location, laws under which chartered, dates of incorporation, variations in volume of sales, associations and volume of business by areas, products and supplies handled, diversity of business, variations in importance of commodities by areas, number of patrons, margins, methods of handling, methods of transportation, services performed for patrons, quantity discounts, credit policy, collection practice, membership, stockholders, directors, managers, financial condition, auditing, and distribution of earnings. In the analyses, groupings are made on the basis of amount of sales, areas of the State, commodities handled, type of business, size of town, number of patrons, sources of purchases, sales outlets, percentages of supplies delivered or collected, credit policy, requirements for membership, etc. A brief analysis and discussion is also included on the other types of organization.

The study showed a total of 410 local cooperative marketing and purchasing associations, of which 313 were exchanges and elevators, 54 livestock shipping associations, 8 creameries, 27 fruit associations, and 8 miscellaneous associations. The total estimated sales were $31,519,000. The average sales were for exchanges and elevators $92,900, livestock shipping associations $21,000, creameries $82,400, fruit associations $14,100, and other associations $32,100.

The organization, practices, and membership participation of two North Carolina farm cooperatives, S. L. CLEMENT (*North Carolina Sta. Bul. 311* (*1937*), *pp. 105, figs. 5*).—This is a study of the Wake Farmers' Cooperative, Inc., a 10-year-old organization covering one county and having for its principal program warehouse service on feed and seed and the selling of eggs and baby chicks, and the Farmers' Mutual Exchange, a 4-year-old organization covering five counties and having for its objective the development of marketing services on poultry, eggs, hams, seeds, and grains, with the supply business in fertilizer, feed, and seed to help develop marketing services. Information was obtained by interviews with 16 charter members, 54 other members, and 90 nonmember patrons of the first association and 55 charter members, 66 other members, and 78 nonmember patrons of the second association. The sample in each case included approximately 20 percent of the members. The development, present organization, capitalization and structure, volume of business, etc., of each association are described. Tables are included and discussed showing for the two types of members, the nonmember patrons, and total persons interviewed the numbers and percentages, the data, information, opinions, etc., obtained as to school attendance; sources of information; attendance at meetings; radio ownership; number of newspapers or magazines subscribed for or received; desire for more information; suggestions received from county agents, agricultural teachers, and other sources; type of tenure; length of farming experience; residence on same farm; size of farm; present and past membership in cooperatives and farm organizations; church attendance; group buying and selling; opinion of confidence in and dealings with managers and directors; services rendered by the associations and the advisability of further extension of services; prices charged by the associations and their effect on general level of prices; credit extended; production credit associations; patronage dividends; quality of supplies; marketing services performed by the associations; frequency and types of meetings; attitude toward cooperation; reasons for trading and length of dealing with the associations; encouragement of neighbors to deal with the associations; proportion of purchases made through the associations and obligations to dealers, etc.; and the criticisms and suggestions for the associations.

The following yardsticks of efficiency are described briefly and as far as the data permit applied to the two associations: Growth and competitive stability, net income, close supervision, operating liquidity, adequate working capital, buying capacity and pricing policy, merchandise capacity, credit extension and collection policy, financial independence, ownership of fixed assets, reserve policy, member equity, shortage or overage, and diversified service.

An appendix presents data as to soils and crops, size of farm, road system, cash income and expenditure for feed, analysis of population, and farm operators by color in the area covered by the two associations.

An analysis of Montana farm prices, P. L. SLAGSVOLD (*Montana Sta. Bul. 345* (*1937*), *pp. 78, figs. 15*).—Tables show, so far as the data were available, (1) for the period January 1908–July 1937 the monthly farm prices and the averages for the calendar year and crop year (August–July) for all wheat,

barley, oats, rye, corn, flaxseed, alfalfa seed, dry edible beans, potatoes, sugar beets, apples, all hay, alfalfa hay, clover hay, timothy hay, beef cattle, sheep, lambs, milk cows, veal calves, hogs, horses, chickens, turkeys, wool, butter, butterfat, and eggs; and (2) by calendar years 1918–36 and crop years 1918–35 the carlot shipments of wheat, flax, rye, peas and beans, potatoes, apples, sugar beets, barley, oats, corn, and all hay. The shipments are also shown in charts. Index numbers of prices, quantities shipped, and gross incomes were constructed for crops (wheat, barley, rye, flaxseed, hay, potatoes, beans, and sugar beets), for livestock (beef cattle, lambs, hogs, butter, and wool), and for farm products (the 13 products used in the crop and livestock indexes). Tables and charts show the three indexes by months and calendar and crop years so far as data are available from January 1908 to July 1937. Other tables and charts show the average prices and indexes of prices of wheat, barley, hay, and lambs 1908–36; butter 1909–36; hogs and eggs 1910–36; beef cattle 1911–36; and flax 1913–36; and for each product during the period 1922–36. The method used in constructing the index numbers is described.

Regional differences in the farm price of Irish potatoes and sweet potatoes, Tennessee and United States, C. E. Allred, P. T. Sant, and E. M. Shannon (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 56 (1937), pp. [1]+III+32, figs. 10*).—"The purpose of this monograph is to show the geographic variations in the price of Irish potatoes and sweetpotatoes in Tennessee, by crop reporting districts, and in the United States by States, and to point out some of the reasons for these price differences." Wide differences are noted.

RURAL SOCIOLOGY

The standard of living of farm families in selected Michigan communities, E. Mumford, J. F. Thaden, and M. C. Spurway (*Michigan Sta. Spec. Bul. 287 (1937), pp. 47, fig. 1*).—Three hundred and seventy-six farm families were included in this study, selected from dairy, fruit, potato, and general farming communities. Data were obtained from the families by the use of score cards, one for standard of living with 83 items and the other for farm practices with 60 items, each card totaling 1,000 points.

The average standard of living score for 240 families was 511 points, the range being from 179 to 884. The variability was greatest for leadership, next for organizational affiliations, and least for family practices. The average farm practice score was 534, the range being from 222 to 790. The families rating highest in each of the six main divisions of the standard of living schedule also scored highest in each of the main divisions of the farm practice schedule. Farmers who had the more efficient farm practices had incomes that were about three times as large as those with the less efficient practices. Standard of living and farm practices were more closely correlated than were standards of living and income. More than one-half of the items contributing to a high standard of living required little or no cash outlay but rather depended upon use of time in the various family practices, in arrangement and beautification of the home and its surroundings, and in participation in the educational, organizational, and recreational programs and activities of the community. Additional years of schooling of the parents and of the children 19 yr. of age and over were associated with relatively higher standard of living scores and also with relatively high farm practice scores. Farmers who maintained regular contacts with agricultural extension activities had an average standard of living score 168 points higher than those with no extension affiliation. Regular readers of agricultural bulletins scored 115 points more

than nonreaders of bulletins. Farmers who had a high standard of living score belonged to three times as many organizations as those with a low rating. Those who exercised leadership by helping to bear the responsibilities of the organizational and institutional life of their communities had a higher standard of living and farm practice rating than other farmers; they farmed larger acreages, had an average of 3 yr. more schooling, read more, and a much larger proportion of them participated in extension and Smith-Hughes activities (83 and 24 percent, respectively) than nonleaders.

The adjustments that most families made during the depression were of two main types: (1) Seventy-one percent produced more of the family living from the farm and (2) adjustments requiring little or no expenditure of money, such as making more use of the opportunities furnished by the community and substitution of inexpensive types of recreation for the more commercial forms.

Social life in the Crooked Creek area, H. J. Bonser (*Pennsylvania Sta. Bul. 345 (1937), pp. 29, figs. 12*).—The area within which this study was conducted was the location of a U. S. Department of Agriculture soil erosion control demonstration. Cooperating farmers agreed to follow for a period of 5 yr. jointly planned procedures involving such undertakings as gully control, tree planting, and changes in cropping systems. A comprehensive economic and social survey of 458 farms in the watershed furnished basic information on certain factors of the levels of living prevailing at the beginning of the demonstration.

"Eighty-nine percent of the people living on the farms in this area had some direct social contact through their organizations. One-fourth of them had attended church and one or more additional organizations. Three-fifths went to church but to no other organization meetings, and 3 percent attended some organization but not church. The Grange reached directly more people than any other nonchurch group. Both attendance at meetings and the exercise of leadership were greater for those families in the higher income groups. As income represented by gross cash receipts rose, the equipment of the farm home became more nearly complete and the number of books per family increased. Age influenced both the extent and the types of social activity. There was a tendency for the aged to decrease all kinds of nonorganizational activity other than visiting with neighbors before surrendering contacts through organizations. The women made more contacts than the men, except in families with young children. The social contacts of part-time farmers both within and outside of organizations were much fewer than those of the full-time farmers. In home equipment, also, they ranked lower. Tenants made fewer contacts in organizations and held leadership positions proportionately less than owners."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Vocational interests of rural high school pupils in Pennsylvania, C. S. Anderson (*Pennsylvania Sta. Bul. 342 (1937), pp. 28, figs. 3*).—"The purpose of this study was to discover the representative nature of the vocational interests of rural high school pupils in Pennsylvania and to test the validity and reliability of expressed interest preferences. Specifically, the problem was to trace the development of group interests of rural secondary school children for possible use in educational planning and to discover the valid extent of the use of individual interest estimates in vocational guidance. Attention was given to some factors which may limit an entirely free and sound expression of vocational interests."

The study was made in rural high schools of the State, teaching vocational agriculture and homemaking, in which the freshman class in September 1929 numbered less than 75. An analysis is made of the records obtained from 345 boys and 359 girls who completed 4-yr. records. A comparative analysis is also made of the records of 126 boys and 154 girls for whom fairly complete records were obtained but who dropped out of school before completing the senior year. A vocational interest questionnaire was submitted to each boy and girl in September 1929, May and September 1930 and 1931, and May and December 1932. The following occupational groupings were included in the questionnaire: Agriculture, artists and entertainers, aviation, clerical, domestic and personal, engineer, lawyer, mechanical, music, nurse, physical education and athletics, physician, public service, scientific, teacher, vocational teacher, trade, transportation and communication, other occupations, and no choice. In September 1929 the Otis Group Intelligence Test, Advanced Examination Form B, was administered, and the boys and girls were divided into three groups, namely, superior quarter, average group, and the below-normal quarter.

While only two out of three boys or girls did not change their vocational preference during any school year or summer vacation, the proportion choosing each occupation remained nearly constant during the 4 yr. Only 37.4 percent of the boys and 39 percent of the girls retained their original vocational interest during the 4 yr. Approximately two-thirds of the choices of boys at any survey period were agriculture, aviation, mechanical work, and engineering, and about the same proportion of girls selected clerical work, nursing, or teaching. In the senior year there was a noticeable decrease in the number of boys choosing aviation and the number of girls choosing teaching. The boys in the above-average intelligence group made more choices in scientific work, engineering, other occupations, and teaching than the below-average group, who most frequently chose mechanical work or agriculture. Girls of superior ability made a larger proportion of the teaching choices. The below-average group predominantly selected nursing. The average number of different vocations chosen by each pupil during the seven survey periods was slightly more than two. Boys choosing agriculture and aviation and girls choosing clerical work, nursing, and teaching were more apt to have made an early permanent choice. Between 25 and 30 percent of the pupils recognized the influence of some person in their choices. About 40 percent of the boys and nearly 30 percent of the girls were consciously influenced by an experience which was, in most cases, doing work or play related to the vocation. Summer vacation employment had no appreciable effect on the choices of boys in September and influenced only half of the 10 percent of the girls who worked away from home. Less than one-fourth of the boys chose their fathers' occupations. The interests of the 280 pupils eliminated from school before the twelfth grade were very similar to those of the below-average intelligence group.

The following conclusions are reached: "(1) The expression of a vocational interest by a boy or girl should be considered as only one of the factors in the determination of the occupation in which success is most likely to be achieved. (2) The permanency of vocational interests of rural secondary school children is as high as was found in this study chiefly because, as the individual interest histories reveal, the interests of each pupil go through a genetic development within a relatively narrow range of vocations. (3) Individual interest histories, compiled at regular intervals during school training, are valuable because they show trends in interests and bring out underlying tendencies, aspirations, and limiting factors that one conference or interest questionnaire cannot define. (4) Rural boys are predominantly interested

in vocations which require a major emphasis on physical activity. . . . (5) A large proportion of rural reared girls are interested in nursing and teaching. (6) There is a tendency for pupils with superior intelligence to choose the professions, and for children below average in native ability to prefer mechanical vocations. (7) In general, pupils of high school age do not have clearly formed, valid reasons for their vocational preference. More accurate occupational information is needed. (8) The majority of eliminated pupils who enter unskilled mechanical and personal service vocations had, while still in school, expressed that type of interest. (9) The opportunity to experience the essential elements of a vocation is the most important influencing factor in the development of a vocational interest."

Profitable farming and life management, W. J. FRASER (*Danville, Ill.: Interstate Prtrs. and Pubs., 1937, pp. 416, figs. 137*).—"It is the purpose of this book to point out a practical, economical method of making the improvements so sorely needed in farming and farm life and to illustrate the necessity and benefit of applying this method or principle of improvement to production, rational consumption, and more abundant living." The chapters are followed by references and questions. An introduction by T. N. Carver is included.

Crop management and soil conservation, J. F. COX and L. E. JACKSON (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, pp. [4]+XVII+610, figs. [200]*).—This is a textbook for secondary schools. The chapters in part 1 (pp. 1–280) present general facts regarding and principles of crop management and soil conservation. Part 2 (pp. 291–576) includes information as to specific crops. The chapters are followed by references and suggestions for discussion. A general plan is suggested for use of teachers in correlating the plan of the text into a program of instruction.

FOODS—HUMAN NUTRITION

A handbook of food preparation, S. F. WEST and L. SORVE (*New York: Macmillan Co., 1937, pp. XI+291, figs. 14*).—In this manual the laboratory procedures are classified under experiments and exercises. Basic recipes are given for each group of related dishes, accompanied by suggestions for variations. The chapters contain questions and problems and are completed by summaries of the underlying scientific principles involved in the preparation of vegetables; fruits; cereals and starches; eggs; milk and cheese; batters and doughs; sugars and sirups; frozen mixtures; meat, poultry, fish, and gelatin; fats and oils; beverages; and in food preparation. The final chapter is devoted to the planning and serving of meals. An appendix contains 43 references.

Food preparation, M. D. SWEETMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, 2. ed., [rev.], pp. XI+449, figs. 54*).—This well-known book has been brought up to date. The general plan remains the same as in the edition previously noted (E. S. R., 68, p. 558).

Nutritive value of milks—plain versus chocolate flavored, W. S. MUELLER and W. S. RITCHIE (*Internatl. Assoc. Milk Sanit. Ann. Rpt., 25 (1936), pp. 61–77, figs. 3*).—Essentially noted from another source (E. S. R., 77, p. 881).

The effect of boiling on the nutritive value of milk, S. GRAHAM and N. MORRIS (*Arch. Disease Childhood, 12 (1937), No. 69, pp. 169–172*).—Two children aged 10½ and 7½ yr., respectively, were given a diet in which milk supplied approximately 50 percent of the calories and 70 percent of the total protein and contained in addition sugar, bread, butter, orange juice, and bananas. For five 7-day periods the milk was given alternately boiled and

raw. Calcium, phosphorus, and nitrogen determinations were made on the feces, urine, and food samples, and the fat content of the feces and diet was also determined. The results indicate that there is no evidence that over short periods the boiling of milk impairs either its absorption or utilization when the diet is adequate. The retention of calcium and phosphorus was slightly lower when boiled milk was consumed.

[Cooking qualities of soybeans] (*Puerto Rico Col. Sta. Rpt. 1936, p. 84*).—A brief report is given of cooking tests on several varieties of soybeans.

Undesirable color change in frozen peas stored at insufficiently low temperatures, H. Campbell (*Food Res., 2 (1937), No. 1, pp. 55–57*).—In this study conducted by the U. S. D. A. Bureau of Chemistry and Soils, chlorophyll extracts were prepared from scalded frozen-pack Alderman peas stored at −20.6° and −6.7° C. for 1½ yr. Spectroscopic examination revealed the presence of pheophytin in the yellow extract prepared from the −6.7° material and demonstrated its absence in the bright green extract prepared from the −20.6° material. It is concluded that the loss of green color in frozen-pack peas stored at insufficiently low temperatures is essentially the slow transformation of chlorophyll into pheophytin as the result of the acids of the cell sap acting on the chlorophyll. It is presumed that the color change in peas acted upon by the *Lactobacillus* group of bacteria during delay before freezing is due to the formation of pheophytin by the action of lactic acid. The fact that scalded peas stored at −6.7° in air-tight containers over ammonia water did not discolor, presumably because the cell acids were neutralized by the ammonia absorbed, is offered as evidence that these acids are responsible for the color change in the peas.

Frozen succotash, J. S. Caldwell, J. M. Lutz, and H. H. Moon (*Canning Age, 17 (1936), No. 12, pp. 449–451, 472*).—To test the possibility of preserving ready-mixed succotash by freezing, succotashes made from various combinations of six varieties of sweet corn, five of lima beans, and one of green snap beans were compared with separately frozen samples of the vegetables mixed at the time of cooking and with samples of the same succotashes preserved by canning.

The frozen combinations were decidedly superior in color, appearance, palatability, fullness, and naturalness of flavor to the canned combinations and compared favorably with the mixtures obtained from the separate packs. Very good products were obtained from combinations of Golden Cross Bantam corn and Fordhook lima beans, Stowell Evergreen corn and Burpee Improved beans, and Stowell Evergreen Hybrid corn with the Henderson variety of lima beans. The combinations containing green snap beans were judged only fair to good in flavor and texture.

Nutritive and therapeutic values of the banana: A digest of scientific literature (*Boston: United Fruit Co., Res. Dept., 1936, pp. 143 [fig. 1]*).—A digest of the scientific literature on the banana in the form of abstracts of articles and books is presented.

Report of two outbreaks of food poisoning, J. C. Geiger (*Pub. Health Rpts. [U. S.], 52 (1937), No. 24, pp. 765–772*).—One outbreak of food poisoning traced to cream custard cake from a single bakery which affected more than 110 persons and another in which 6 persons became ill and 3 died after eating a commercially canned antipasto are reported. In five mild cases of botulism intravenous injection of 10 percent hypertonic solutions of glucose proved effective, as judged by a decrease in the intensity of the signs of intoxication.

An outbreak of Salmonella food infection caused by filled bakery products, E. J. Staff and M. L. Grover (*Food Res., 1 (1936), No. 5, pp. 465–479,*

figs. 2).—An outbreak of food infection is reported in the eastern part of the State of Rhode Island in March 1935 which produced the classical gastroenteric symptoms in 208 persons and resulted in three deaths. The common factor was a cooked cream filling contaminated with *S. enteritidis*. Bacteriological and epidemiological evidence suggests the possibility of rodents as the contaminating agents.

Staphylococci in relation to food poisoning, G. M. Dack (*Amer. Jour. Pub. Health, 27 (1937), No. 5, pp. 440–443*).—In this review paper the author notes that the enterotoxic substance may be produced under natural conditions in high protein foods, as well as foods rich in starch, and that the toxic quality is not completely destroyed after 30 min. of exposure to the temperature of boiling water or low temperature storage for 67 days. Products such as cream-filled pastry and cakes may become contaminated during manufacture and the organisms, which have been dormant during refrigeration, after purchase will multiply and elaborate the poison if left for a few hours at room temperature. Custard-filled puffs and éclairs are not impaired in flavor or appearance after reheating at a temperature sufficient to kill the staphylococci. Outbreaks of food poisoning due to staphylococci have also been traced to other foods such as cheese, gravy, doughnuts, milk, ice cream, and meat sandwiches.

Influence of temperature on growth and toxin production by Clostridium botulinum, F. W. Tanner and E. W. Oglesby (*Food Res., 1 (1936), No. 6, pp. 481–494*).—The development of different strains of *C. botulinum*, *C. putrificum*, *C. sporogenes*, and *C. thermosaccharolyticum* was studied in different media at different temperatures and in liquid media inoculated with toxin-free spores of *C. botulinum*. To determine the toxicity the cultures were injected into mice.

It appears that the temperature required for the germination of spores is higher than that at which growth and multiplication will occur. Growth occurred and toxin was produced within a few days at 15° C. when vegetative cells were inoculated and at 20° when either vegetative cells or spores were inoculated. At 10° the growth of vegetative cells occurred only after at least 27 days, with no growth of detoxified spores after 47 days. The different strains of *C. botulinum* showed marked variations in their temperature relations. The results would seem to indicate that foods stored at room temperature or under only slight refrigeration may become dangerous fairly rapidly, but when kept at temperatures lower than 10° (50° F.) will remain safe for a considerable length of time.

An outbreak of botulism in Wyoming, R. B. Lindsay, J. R. Newnam, and I. C. Hall (*Jour. Amer. Med. Assoc., 108 (1937), No. 23, pp. 1961–1964*).—An outbreak of botulism which caused two deaths following the eating of home-canned wild mushrooms of unknown species is described. The mushrooms had been packed cold in quart glass jars with a little garlic and salt and steamed for 4 hr. in a water bath. Upon opening they were fried in butter with tomato paste and seasonings. Examination showed the presence of a weak type A toxin of *Bacillus botulinus*.

Antimony in food poisoning, E. Kaplan and F. A. Korff (*Food Res., 1 (1936), No. 6, pp. 529–536*).—The authors discuss the possibility of contamination of food with antimony, reporting tests which show that as much as 26.7 mg of total antimony was extracted from cheap enamel vessels by hot 2 percent tartaric acid but not more than 2.64 mg by sauerkraut. Since 1928 three outbreaks in England have been traced to the consumption of lemonade prepared in buckets containing antimony in the enamel and not ordinarily used for food and drink. Although no cases of illness definitely diagnosed as antimony

poisoning have been attributed to the use of enameled cooking vessels, utensils containing antimony compounds are not recommended for the storage and preparation of acid foods.

Digestion and health, W. B. Cannon (*New York: W. W. Norton & Co., 1936, pp. IX+11-160, figs. 14*).—This book contains a presentation in a modified form of the lectures of Beaumont which appeared in 1833, and discusses the nature of appetite, hunger, and thirst; digestion and bodily vigor; and indigestion from pain, worry, and excitement.

Basal metabolism of normal young men and women of various races in Hawaii and basal metabolism of Samoan men, C. D. Miller and F. G. Benedict (*Hawaii Univ., Res. Pubs. No. 15 (1937), pp. 71, figs. 2*).—This study is reported in two parts.

Part 1, which was previously noted briefly from another source (E. S. R., 77, p. 420), contains data on 258 subjects and includes in addition to the racial groups given in the previous report pure Hawaiian male and female and Korean male subjects.

Arranged in order of descending average deviations from the Harris-Benedict prediction standards, the racial groups are classified as follows for the men: Pure Hawaiian −6.8 percent, Caucasian −6.7, part Hawaiian −6.1, Korean −5.8, Chinese −5.3, Japanese −2.8, and Chinese-Hawaiian −2.4 percent. The similar classification for the women is as follows: Chinese −15 percent, Chinese-Hawaiian −13.7, Japanese −10.8, Caucasian −7.8, part Hawaiian −7.4, and pure Hawaiian −6.8 percent. It is evident that these groups of women living in Hawaii have a basal metabolism appreciably lower than the corrected American standards. "The results . . . support the idea that the prediction standards for all women should be lowered at least 5 percent."

In part 2, using the same technic, basal metabolism tests were made on 21 young men of pure Polynesian ancestry living in Samoa. The values obtained are essentially the same as the Harris-Benedict prediction standard, but are definitely higher than those found for the Caucasian men and the other racial groups living in Hawaii.

The nutritive value and cost of the Philippine constabulary ration, I. Concepcion (*Philippine Jour. Sci., 62 (1937), No. 1, pp. 89-114*).—A study of the variety in the weekly constabulary ration showed that it contains approximately 50 foodstuffs as compared with about 40 in the average American family dietary and from 20 to 30 in the average Filipino family dietary. The protein, fat, carbohydrate, phosphorus, and iron contents and the number of calories compare favorably with the American standards, but the diet is very deficient in calcium and low in the vitamin-carrying foods. The cost per 1,000 calories is low as compared with figures given for army rations for other countries, and the percentage distribution among the different classes of foodstuffs is poor. It is recommended that the ration should include more milk, fresh fruits, leafy vegetables, potatoes, and onions and less meat and fish.

An investigation into the health of 1,530 pre-school children, P. Henderson (*Arch. Disease Childhood, 12 (1937), No. 69, pp. 157-168, fig. 1*).—It was found that 51 percent of the 1,014 children under 2 yr. of age and 70 percent of the 516 children over 2 yr. had one or more physical defects other than disorders due to faulty methods of feeding. Approximately 44 percent of the older group had dental caries and 11 percent of the entire group were undernourished. Only 13 cases of active rickets were found. A study of the economic conditions of the homes of 1,214 children showed that 30 percent were being maintained on incomes too low to allow the purchase of foods stated by the nutrition committee of the British Medical Association to be the minimum essential for health.

Influence of certain fruits on fecal flora and intestinal reaction in diets of rats, W. B. ESSELEN, JR. (*Food Res., 2 (1937), No. 1, pp. 65–72, figs. 2*).—Contributing from the Massachusetts Experiment Station, the author determined the effect of fruit diets on the intestinal flora, intestinal putrefaction, and intestinal acidity of the albino rat in studying the beneficial action of fruit diets for intestinal disorders.

Bacteriological studies of the feces of rats before and after varying percentages of dried and raw cranberries were added to the diet demonstrated that a 20-percent cranberry diet is effective in reducing the numbers of fecal gas-producing and *Escherichia coli* bacteria. In animals receiving 1 percent ferric oxide supplement to the basal diet for 10 days, the degree of reduction of ferric to ferrous oxide was determined before and after the inclusion of 10 percent dried cranberries or 20 percent fresh cranberries, fresh McIntosh apples, and fresh cultivated blueberries and showed that diets containing 20 percent of these fruits materially decreased intestinal putrefaction. H-ion determinations of the intestinal contents of rats receiving the basal diet, with and wihout 10 and 20 percent raw cranberries, or a 100-percent raw apple diet showed that the inclusion of these fruits significantly increased the acidity of the contents of the cecum and large intestine.

Investigations into refection, M. NATHAN (*Acta Path. et Microbiol. Scand., 14 (1937), No. 3, pp. 383–411, fig. 1*).—The literature on refection, a condition which occurs in rats receiving a diet low in or free from vitamin B_1 and is characterized by normal growth in spite of inadequacy of intake and by the excretion of voluminous white feces with a particularly large content of undigested starch and containing characteristic vibriones, is reviewed.

The results of a series of tests on groups of rats receiving normal and vitamin B_1-free diets supplemented by feces from refected animals suggest that pronounced deficiency of vitamin B_1 is not needed for the occurrence of spontaneous refection.

Methods for determining by quantitative analysis the starch content of the feces and the percentage of digestibility of the fecal or intestinal starch in relation to that of ordinary starch are described. With potato starch as the sole source of carbohydrate, the rats on the vitamin B_1-free diet grew almost normally and excreted relatively large quantities of starch. There appears to be "a close relation between the two phenomena, normal growth of refected rats fed on a B-free diet, in which a portion of the starch becomes indigestible within the rat, and the normal growth of animals fed on a B-free diet containing potato starch which was difficult to digest before."

Use of air in basal metabolism, C. V. PERRILL and K. K. JONES (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 444–448, fig. 1*).—A basal metabolimeter with the spirometer incorporated in an auxiliary tank is described and illustrated. The machine has a capacity of 40 l, which is sufficient to provide the patient with fresh warmed air for the entire 6-min. test period. When tested on six subjects the results agreed within 2 percent of those obtained with a Benedict machine.

Iron versus iron and copper in the treatment of anemia in infants, C. A. ELVEHJEM, D. DUCKLES, and D. R. MENDENHALL (*Amer. Jour. Diseases Children, 53 (1937), No. 3, pp. 785–793, figs. 4*).—In this extension of earlier studies at the Wisconsin Experiment Station (E. S. R., 74, p. 884), hemoglobin determinations were made by the Newcomer method about once every 4 weeks on infants with normal hemoglobin and at more frequent intervals on anemic infants. During the first part of the study the anemic infants were given iron in the form of ferric pyrophosphate, and later copper sulfate supplements were also administered.

The healthy well-fed infants having a sufficient reserve of iron and copper maintained an average level of from 11.5 to 12.5 g of hemoglobin per 100 cc of blood throughout the first 2 yr. of life. The administration of iron supplemented with copper brought about a maximum response in the regeneration of hemoglobin in the anemic infants, whereas iron alone gave an inadequate response. During periods of infection the administration of medicinal iron and copper was ineffective.

Does liver supply factors in addition to iron and copper for hemoglobin regeneration in nutritional anemia? E. B. HART, C. A. ELVEHJEM, and G. O. KOHLER (*Jour. Expt. Med., 66 (1937), No. 2, pp. 145–150, figs. 2*).—In continuation of the series of investigations conducted at the Wisconsin Experiment Station (E. S. R., 76, p. 723), the authors demonstrate in this study that the value of liver in the treatment of anemia induced by feeding rats on a milk diet depends directly upon the amount of available iron and copper contained in the liver. Commercial preparations containing iron or iron and copper combined with whole liver, liver extract, or other liver preparations were analyzed for iron and copper and were fed to rats at levels sufficient to supply 0.5 mg of iron daily. The wide variations noted in the hemoglobin-regenerating efficiency of the different preparations is correlated directly with their iron and copper contents.

Vitamins and other dietary essentials, W. R. AYKROYD (*London: William Heinemann, 1936, 2. ed., pp. XII+226*).—In the new edition of this book (E. S. R., 71, p. 126), the author has made some deletions and additions to the text without altering the original plan of discussing certain aspects of the science of dietetics for the benefit of the general reader.

Effect of calcium and vitamins A and D on incidence of pregnancy toxaemia, G. W. THEOBALD (*Lancet [London], 1937, I, No. 24, pp. 1397–1399*).—One hundred apparently healthy women not more than 24 weeks' pregnant were divided into two equal groups and to the diet of one group 20 grains of calcium lactate, 11,000 international units of vitamin A, and 450 units of vitamin D were added. The incidence of toxic symptoms, such as hypertension and albuminuria, was 13 among the treated women and 28 in the untreated group, and of other symptoms such as hyperemesis, edema, headaches, cramps, and insomnia 10 and 21, respectively. The difference in the incidence of complications between the two groups is attributed to the calcium lactate and vitamin supplements given.

Biological assays for flavin and dermatitis factor(s), C. A. COOK, M. F. CLARKE, and A. E. LIGHT (*Science, 85 (1937), No. 2212, pp. 503, 504*).—To measure the amount of flavine in biological materials, 16-day-old rats and their mothers were placed on a diet consisting of 35 percent casein, 56 sucrose, 5 Crisco, and 4 percent Osborne and Mendel salt mixture supplemented by a cod-liver oil concentrate supplying 20 units of vitamin A and 4 units of vitamin D per gram of diet. At 21 days of age, 90 mg of an extract of rice polishings was supplied daily to provide 6 international units of vitamin B_1 and the factor or factors in the vitamin G complex other than flavine. Selected dose levels of the test material were fed daily. The positive control rats received 15 μg of pure flavine, which permitted an average daily growth rate of from 1.5 to 2 g. for 4, 6, or 8 weeks.

A second type of assay is described which is based on the recovery of flavine-deficient rats, as shown by the resumption of growth at an average rate of 2 g per day for 2 weeks when 15 μg of pure flavine were administered. The method requires a longer experimental period but is more sensitive to lower levels of flavine.

Both methods have been used to measure the factor or factors other than flavine in the vitamin G complex. Following the first method the basal diet was supplemented with 15 μg of flavine and 6 international units of vitamin B_1, together with doses of the test material. The control rats received 90 mg of rice polishings concentrate, which permitted an average daily growth rate of from 1.5 to 2 g for from 4 to 8 weeks. In the second method 30 μg of crystalline vitamin B_1 and 15 μg of flavine were fed daily during the depletion period. When from 75 to 90 mg of rice polishings concentrate was substituted for the crystalline vitamin B_1, growth was resumed at an average daily rate of 2.3 and 2.6 g, respectively, for 4 weeks, while a 50-mg dose level of the concentrate yielded 1.3 g weight gain daily. The negative control rats receiving only vitamin B_1 and flavine developed progressive dermatitis in approximately 5 weeks and were cured by the administration of the rice polishings concentrate. The subjection of the concentrate to ultraviolet irradiation did not affect the biological factor or factors, but autoclaving resulted in partial destruction.

The use of a 10-day period for the assay of vitamin B by rat growth technic, F. W. Schlutz and E. M. Knott (*Jour. Nutr., 12 (1936), No. 6, pp. 583–596, figs. 6*).—The authors describe a short-period technic for vitamin B (B_1) and report the results of its application to groups of experimental rats.

The amount of growth shown during the 10-day period was found to be a criterion of the vitamin B contained in the supplementary material if the rats weighed about 60 g at the beginning of the depletion period, the basal ration contained autoclaved whey in place of yeast and sucrose instead of dextrose, and the amount of supplement fed was just sufficient to allow a weight gain of from 1 to 2 g per day. The quantity of vitamin B causing a 1-g gain in weight is suggested as a unit, and is comparable to the Ammerman and Waterman (E. S. R., 76, p. 423) curative dose and approximately equal to 2 Chase and Sherman units.

A quantitative study of the utilization and retention of vitamin B by young children, E. M. Knott (*Jour. Nutr., 12 (1936), No. 6, pp. 597–611, figs. 2*).—The utilization of vitamin B (B_1) as affected by three different levels of ingestion was studied by comparing the retentions of eight young children during 23 metabolic periods. Biological assay with rats gave the amount of vitamin B in the food and excreta of the subjects during a 3-week period.

The results show that with higher intakes for each level of ingestion increasingly higher retentions of the vitamin were obtained. "On the basis of the ingestions giving the highest retentions, the optimum requirement of vitamin B by young children is estimated to be 20 units per kilogram of body weight, or about 40 Chase-Sherman units per kilogram per day."

Note on the variation in the vitamin B_1 activity of raw wheat germ, A. Z. Baker and M. D. Wright (*Jour. Hyg. [London], 37 (1937), No. 2, pp. 303–306, figs. 3*).—The vitamin B_1 content of 118 samples of cleaned germ from 11 different sources of raw wheat was determined by animal bioassay, using the bradycardia method as developed by Birch and Harris (E. S. R., 73, p. 567). A definite variation was shown, with 58 percent of the vitamin B_1 values lying between 10 and 16 international units per gram.

Action of synthetic vitamin B_1, C. R. Eckler and K. K. Chen (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 458–460*).—The potencies of the natural and the synthetic crystalline vitamin B_1 in the form of the hydrochloride were compared in polyneuritic rats and pigeons. Pharmacological effects were studied in a cat and a rabbit, and the minimum lethal dose of both products was determined by intravenous injection into guinea pigs. The results indicate that the two products are identical.

The vitamin B_2 complex and allied factors.—I, Mammalian factors, J. R. O'Brien and R. A. Peters (*Cur. Sci.* [*India*], *5* (*1937*), *No. 11, pp. 577–582*).—The authors review the several vitamin B_2 and allied factors of the rat, pigeon, chick, dog, and man and discuss the chemical structure and physiological properties of the factor flavine which has been isolated in crystalline form from natural sources. The effects of a deficiency of vitamin B_6, which is still an impure concentrate and probably contains additional factors, are described. The distribution of flavine and vitamin B_6 in animal tissues, milk, and yeast is given. The conflicting reports of vitamin B_6 tests are noted briefly. The conclusion is made that vitamin B_6 is a factor distinct from both the P–P and the antiblacktongue factors, although the two latter factors may be identical. The possible relationship of the antianemic factor and the vitamin B_2 complex is still unsolved.

Effect of artificial achylia gastrica and a diet restricted in vitamin B_2 (G) on hematopoiesis, S. R. Mettier and K. Purviance (*Soc. Expt. Biol. and Med. Proc.*, *36* (*1937*), *No. 4, pp. 429–432, fig. 1*).—The administration of a diet low in vitamin B_2 (G) for approximately 80 days to 3 gastrectomized dogs did not produce macrocytic anemia, as judged by the blood picture. The animals demonstrated the symptoms characteristic of blacktongue, with slight loss of body weight, diarrhea, and progressive weakness.

Vitamin-C content of potatoes prepared for table use by various methods of cooking, J. E. Richardson, R. Davis, and H. L. Mayfield (*Food Res.*, *2* (*1937*), *No. 1, pp. 85–95*).—In this contribution from the Montana Experiment Station the Vitamin C content of two varieties of potatoes, Netted Gem and Bliss Triumph, grown on irrigated land and stored for from 4 to 8 weeks was determined by animal bioassay, by the Tillmans method as modified by Bessey and King (E. S. R., 71, p. 137), and by iodine titration. Chemical determinations only were made on samples of the potatoes cooked in various ways.

The following values as determined by dye titration are reported: Netted Gem, raw 0.133 mg per gram, boiled 0.128, steamed 0.141, pressure cooked 0.115, baked 0.17, American fried in butter 0.094, German fried in butter 0.118 and in Crisco 0.137, mashed 0.108, and escalloped 0.094 mg per gram. The following are the comparable values for the Bliss Triumph: 0.126 mg, 0.149, 0.172, 0.122, 0.122, 0.22, 0.068, 0.134 (no value is given for the German style in Crisco), 0.146, and 0.12 mg per gram, respectively. Approximately 4 g of raw potato of either variety furnished a minimum protective dose for guinea pigs. It is noted with one exception that Bliss Triumph potatoes cooked by the various methods contained more vitamin C per gram than Netted Gem. The amount of vitamin C contained in 150-g servings of the potatoes cooked by the different methods is given.

Stability of vitamin C in sweet corn to shipping, freezing, and canning, C. F. Dunker, C. R. Fellers, and G. A. Fitzgerald (*Food Res.*, *2* (*1937*), *No. 1, pp. 41–50, fig. 1*).—The ascorbic acid content of raw, fresh cooked, frozen, and whole grain canned Golden Bantam sweet corn and of a white, cream-style canned sweet corn was determined by the Tillmans method as modified by Bessey and King (E. S. R., 71, p. 137) and by animal assay on guinea pigs according to the Sherman, LaMer, and Campbell method (E. S. R., 46, p. 865). Dye titrations only were made on 12 samples of market sweet corn in the husk, 10 different brands of canned sweet corn, fresh corn in the husk stored at room temperature and at refrigerator temperature (4.4° C.), blanched, raw, fresh, whole-kernel corn at −23.3°, canned corn removed from the can and exposed to the air at 4.4°, frozen samples of whole-kernel corn and corn on the cob before and after 34 days' storage at −23.3° and also during defrosting,

and on sweet corn grown at the Massachusetts State College over a 50-day period during the harvesting season.

Although satisfactory checks were obtained on fresh raw and cooked corn between the two methods, the bioassay method gave much lower results on canned and frozen sweet corn, which may be due to oxidation of ascorbic acid while exposed to the air in the feeding cups. The following vitamin C values are reported: Fresh raw 51, fresh cooked, frozen, and whole-kernel canned 45, cream-style canned 40, and white cream-style canned corn 45 international units per ounce. Except for one which contained 17, the 10 varieties of commercially canned sweet corn varied from 40 to 57 international units of vitamin C per ounce. Market sweet corn in the husk and raw sweet corn fresh from the field both had a mean vitamin C value of 0.09 mg per gram. Canned white corn reheated to boiling for 1 min. lost 5 and canned yellow corn 8.6 percent, frozen whole-grain corn cooked 4 min. in boiling water lost 7.3 percent, and fresh raw corn on the cob cooked 12 min. in boiling water lost 6.7 percent of the ascorbic acid content.

Fresh sweet corn stored at refrigerator and at room temperature for 24 hr. lost less than 10 percent and for 4 days less than 50 percent of the vitamin C content. Very slight losses occurred at −23.3° and during 1- to 2-day transit in cold storage. Canned corn stored at 4.4° after opening lost from 35 to 50 percent during 4 days. Frozen samples of whole-kernel and fresh corn on the cob did not lose any vitamin C during 34 days' storage at −23.3° and only 6 percent during complete defrosting at room temperature. The ascorbic acid content of fresh sweet corn harvested August 15 was 0.09 mg per gram, August 17 0.12, September 10 0.08, and October 6 0.07 mg per gram. "From these limited data it may be assumed that sweet corn picked early in the season has a somewhat higher ascorbic acid content than that picked later in the season."

Varietal differences in the vitamin C (ascorbic acid) content of tomatoes, F. Tripp, G. H. Satterfield, and A. D. Holmes (*Jour. Home Econ., 29 (1937), No. 4, pp. 258–262*).—A study is reported of the vitamin C content of 10 varieties of tomatoes grown on sandy loam soil and of 2 samples of commercially canned tomato juice. The tomatoes were picked when nearly ripe, and for whole tomato determination a thin slice through the middle was removed and the remainder placed in an atmosphere of nitrogen at approximately 40° C. before being juiced by light squeezing without contact with any metal. The whole tomato sample was macerated with acetic acid, centrifuged, filtered, and the extracts in solution were titrated with 2,6-dichlorobenzenoneindophenol, following the Tillmans method as modified by Bessey and King (E. S. R., 71, p. 137). The juice samples were centrifuged, filtered, and acetic acid was added prior to titration with the dye.

The following values are reported for the ascorbic acid content per gram of whole tomato: Pritchard 0.218 mg, Louisiana Pink 0.217, Greater Baltimore 0.179, Break-o'-Day and Scarlet Dawn 0.176, Grothen 0.167, Louisiana Gulf State and Walter Richards 0.166, Marglobe 0.159, and John Baer 0.148 mg per gram. The values for tomato juice reported are Louisiana Pink 0.313 mg, Pritchard 0.282, Scarlet Dawn 0.254, Greater Baltimore 0.241, Walter Richards 0.234, Break-o'-Day and Marglobe 0.232, Grothen 0.228, John Baer 0.224, and Louisiana Gulf State 0.147 mg per cubic centimeter of juice. Two samples of commercially canned tomato juice contained 0.208 and 0.196 mg per cubic centimeter of juice. It is observed that the vitamin C values of soft and overripe tomatoes were lower than those of firm ripe ones, and that no consistent relationship exists between the size of the tomato and the vitamin C content.

Nutritional value and vitamin C content of Hungarian apples, J. BECKER (E. BECKER) (*Mitt. K. Ungar. Gartenbau-Lehranst., 2 (1936), pp. 31–37, fig. 1; Eng. abs., p. 37*).—In determinations made on 14 varieties of Hungarian apples, the percentage of dry matter in the edible part varied from 10.45 to 18.82, total acid from 0.38 to 0.79, and invert sugar from 6.1 to 11.27. The vitamin C content varied from 25 to 165 mg per kilogram. "Variety is undoubtedly the most important factor which determines the vitamin C content, but Hungarian soil and climate may also [account] for the high vitamin values."

The ascorbic acid content of fruits and vegetables with special reference to the effect of cooking and canning, M. OLLIVER (*Jour. Soc. Chem. Indus., Trans., 55 (1936), No. 24, pp. 153T–163T, figs. 5*).—Using the Birch, Harris, and Ray modification (E. S. R., 69, p. 169) of the Tillmans titration method, the author determined the ascorbic acid content of 22 fruits and vegetables, raw and after subjection to different methods of cooking and canning, and of 5 samples of commercially bottled and canned fruits. Ascorbic acid values are reported for different portions of the apple, pear, orange, spinach, asparagus, and peas; for raw gooseberries and greengage plums after storage at room temperature and in the cold; for seven varieties of oranges; and for canned fruits and vegetables after cold storage for from 7 days to 36 weeks.

Due to the marked variation observed in the amount of ascorbic acid present in different parts of individual fruits and vegetables and in different varieties of one fruit, it is suggested that limits of variation rather than fixed values should be given to the vitamin C content of fruits and vegetables. The ascorbic acid content decreased markedly in vegetables stored at room temperature and to a slightly smaller extent at 32° F. The loss of ascorbic acid in fruits appears to be counterbalanced by the increase due to the ripening process. The loss incurred during cooking and canning was small, and at the end of these processes the vitamin C was frequently evenly distributed through the solid and the liquid. In some vegetables an apparent gain in vitamin C content was shown after cooking and canning. For practical purposes the loss during cold storage was not very significant. Time tables are given which show the amounts of raw, cooked, and canned fruits and vegetables required to give 30 mg of ascorbic acid.

Ascorbic-acid content of bananas at three stages during ripening, R. M. LEVERTON (*Food Res., 2 (1937), No. 1, pp. 59–63*).—Using the 2,6-dichlorophenolindophenol titration method of Tillmans, as modified by Bessey and King (E. S. R., 71, p. 137), with hot 18 percent acetic acid for the first extraction, followed by two extractions with 8 percent acetic acid, both containing metaphosphoric acid as suggested by Mack and Kertesz (E. S. R., 77, p. 151), the ascorbic acid content of bananas taken from the same hand in the green, yellow, and ripe stages was determined in 21 hands. Expressed as milligrams of ascorbic acid per gram of banana pulp, the average values are reported as green 0.061 mg, yellow 0.063, and ripe 0.073 mg per gram. The ripe bananas were always higher in ascorbic acid than the green ones taken earlier from the same hands.

Some observations on vitamin-C content of oranges and lemons, J. E. RICHARDSON, R. DAVIS, and P. SULLIVAN (*Food Res., 2 (1937), No. 1, pp. 81–83*).—In this contribution from the Montana Experiment Station the ascorbic acid content, determined by the Tillmans method as modified by Bessey and King (E. S. R., 71, p. 137), and by titration with 0.01 N iodine solution, gave the following values: California Valencia, choice (size 176), 0.39 and 0.44 mg, respectively, by the dye and iodine titration determinations; Valencia, fancy (size 200), 0.43 and 0.47 mg; navel, fancy (size 200), 0.61 and 0.63 mg; and navel, fancy (size 216), 0.62 and 0.68 mg per cubic centimeter of juice, respec-

tively. The vitamin C content of an average orange, as determined by the two methods, is given as 20.5 and 23.1 mg, respectively, for the Valencia, choice, containing 52.5 cc of juice; 21.5 and 23.5 mg for the Valencia, fancy, containing 50 cc; 31.7 and 32.8 mg for the navel, fancy, containing 52 cc; and 23.3 and 25.5 mg, respectively, for the navel, fancy, containing 37.5 cc of juice. Both methods gave 0.49 mg per cubic centimeter of juice or 17.6 mg per average lemon for the Sunkist, fancy variety.

Vitamin-C content of dairy orange beverages, M. J. Mack, C. R. Fellers, W. A. Maclinn, and D. A. Bean (*Internatl. Assoc. Milk. Sanit. Ann. Rpt., 25 (1936), pp. 267–274*).—Essentially noted (E. S. R., 77, p. 425).

The question of the vitamin C deficit in pregnancy and during lactation [trans. title], G. Gaehtgens and E. Werner (*Klin. Wchnschr., 16 (1937), No. 24, pp. 843, 844*).—The method of Jezler and Kapp of estimating the state of saturation with respect to vitamin C by determining the number of days required for saturation following daily test doses of 300 mg of ascorbic acid was used on 26 healthy pregnant women between the ages of 17 and 32 yr. The period of pregnancy ranged from 6 mo. to term. If 50 percent or more of the half-day dose (150 mg) was excreted on the third or fourth day, the subject was considered to be in a normal state of saturation. Of the 16 primiparae 10, and of the 10 multiparae 7 (62 and 70 percent, respectively), showed a significant saturation deficit, with average lengths of time before saturation of 5.9 and 5.3 days, respectively.

Similar tests conducted in the early days of lactation on 33 subjects indicated a deficit in 75 percent of the number, with an average of 2 additional days before saturation. These subjects had also shown a deficit during pregnancy. When the excretion values on the third, fourth, and fifth days of the test doses were added to the estimated vitamin C content of the milk produced, as reported by Neuweiler, practically normal values for the total vitamin C output were obtained with subjects who had shown a prolongation of the test dose period to 5 or 6 days. With this adjustment the percentage of cases showing a deficit also dropped from 75 to 57 percent. This is thought to indicate that a deficiency during pregnancy was not increased during lactation with its extra output of ascorbic acid in the milk.

Fixation of ascorbic acid by tissues, H. C. Hou (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 833–835*).—The results of tests made on tissues from scorbutic and nonscorbutic guinea pigs show that the scorbutic tissues were able to take up more ascorbic acid from Ringer solution than the normal tissues. The adrenal tissue took up to its full capacity during the first hour of incubation, the intestine took up more during the following 4 hr. than during the first hour, whereas the other tissues tested took up comparatively little after the first hour of incubation. Of the tissues studied, the capacity for ascorbic acid appeared to be greatest in the adrenal and muscle tissue, lower in the skin, and least in the intestine and kidney tissue.

Rate of urinary excretion of test doses of ascorbic acid, E. E. Hawley and D. J. Stephens (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 854–858, figs. 2*).—This report gives the results of a study of the rate of excretion of test doses of 100 and 200 mg ascorbic acid administered by mouth (orange juice or crystalline ascorbic acid) and intravenously (crystalline ascorbic acid) to subjects who were unsaturated with respect to vitamin C as a result of the intentional administration of a diet low in antiscorbutic foods for several days, or saturated following the administration of large quantities of orange juice.

The urine specimens were collected at hourly intervals for 6 hr. after the administration of the test dose and then in two 3-hr. periods. The urine voided between the twelfth and twenty-fourth hours was pooled in a single sample. All specimens were kept in the refrigerator in dark-brown stoppered bottles containing glacial acetic acid until titration, which except for the night samples was carried out within an hour after voiding.

Composite curves for 50 experiments on unsaturated and saturated subjects receiving the vitamin orally or intravenously are given in hourly excretions of the test dose expressed as percentages of the test dose and of the total 24-hr. excretion.

In the depleted subjects there was only a slight increase in the rate of excretion during the first few hours, while in the saturated subjects an average of from 80 to 85 percent of the total 24-hr. excretion occurred during the first 12 hr. after the administration of the test dose. Maximum excretion occurred during the first and second hours after intravenous treatment and during the third, fourth, fifth, and sixth hours after oral administration.

TEXTILES AND CLOTHING

The sterilization of wool and its effect on physical and chemical properties of a wool fabric, H. HUMFELD, R. E. ELMQUIST, and J. H. KETTERING (*U. S. Dept. Agr., Tech. Bul. 588 (1937), pp. 27, figs. 2*).—In tests to determine the most satisfactory sterilizing method for subsequent bacteriological studies on wool fabrics, using as the test organism *Bacillus mesentericus*, physical and chemical changes in the fabric caused by the sterilizing treatments were measured by strength index, weight, thickness, flexural properties, sulfur and nitrogen content, methylene blue absorption, and scale breakage.

Heating in xylene, Stoddard solvent, or tetrachloroethylene was satisfactory from the bacteriological standpoint and in general left the fabric essentially unchanged. Ultraviolet light, potassium permanganate, iodine, alcohols, glycerol, tribromobetanaphthol, and tetrachloroethane did not produce sterility under the experimental conditions. Sodium phenylphenates prevented growth, even when present in extremely small quantities, but did not kill the organisms. Although formaldehyde and mercuric salts gave sterility, they were retained by the wool and therefore rendered the fabric unfit for subsequent bacteriological studies. Intermittent steaming and dry and wet autoclaving produced sterility but so changed the physical and chemical properties of the fabric as to interfere with its use value.

Tests on unused and on "worn-out" plain-weave, cotton fabrics, S. DAVISON and A. E. GINTER (*Jour. Home Econ., 29 (1937), No. 5, pp. 333–335*).—Data are presented to show the comparative strength of 33 new and discarded plain weave cotton fabrics. The yarn count and weight in ounces per square yard were determined for each fabric, and tensile strength tests were made. In the majority of the fabrics the filling strength was lower than the warp strength, and the decrease in strength in the used fabrics was much greater fillingwise than warpwise.

The effects of laundry methods on cotton fabrics, A. E. GINTER, M. SHADDUCK, M. PARTLOW, and T. PEARSON (*Jour. Home Econ., 29 (1937), No. 5, pp. 319–326*).—The effects of commercial and home laundry methods were studied on five plain weave fabrics of the muslin variety, ranging in price from 17 to 45 ct. a yard and in weight from 1.623 to 2.842 oz. per square yard. Determinations were made on the unlaundered fabrics for fiber measurements, yarn number, twist and ply, water-soluble sizing, weight, thickness, thread count,

and tensile strength, and after 1, 5, 15, 30, 45, 75, and 100 launderings by each of seven methods for tensile strength, weight, thickness, thread count, and shrinkage. The fabrics were left unsoiled between launderings. The results were also analyzed to show the effects due to ironing.

The commercial washing methods caused less decrease in the strength of fabrics during the first 15 launderings but more thereafter than did the home methods. The amount of shrinkage was similar with all methods. In the commercial process ironing was responsible for much of the decrease in strength fillingwise, but in the home method, after the first few launderings, the washing procedure appeared to be more responsible for the strength loss and other changes.

The durability of cotton garments as affected by laundering and wear, A. E. GINTER, K. ADKINS, S. DAVISON, and S. PEARLMUTTER (*Jour. Home Econ., 29 (1937), No. 5, pp. 326–332*).—Durability tests were made on 48 nightdresses made from five cotton muslin fabrics varying in price from 10 to 29 ct. a yard. The commercial and home laundry methods used in the study noted above were followed. Physical tests such as tensile strength and abrasion, thread count, thickness, weight, and shrinkage were made on the unused materials and for each garment at intervals after from 5 to 130 launderings and when the garment was worn out.

No constant relationship seemed to exist between the price of the fabric and any one of the physical characteristics studied. The effect of body wear was found to be greater than that of laundering. The signs of deterioration due to wear were greatest under the arms and across the shoulders of the garments, whereas those due to laundering were greatest along the folds and the edges of the heavy seams.

Fabrics and designs for children's clothes, C. L. SCOTT and M. SMITH (*U. S. Dept. Agr., Farmers' Bul. 1778 (1937), pp. 24, figs. 30*).—This bulletin is a revision of and supersedes Leaflets 52 (E. S. R., 62, p. 298), 63 (E. S. R., 64, p. 97), 79 (E. S. R., 66, p. 199), and 80 (E. S. R., 66, p. 97).

HOME MANAGEMENT AND EQUIPMENT

Family living in Knott County, Kentucky, F. M. WILLIAMS, H. K. STIEBELING, I. G. SWISHER, and G. S. WEISS (*U. S. Dept. Agr., Tech. Bul. 576 (1937), pp. 69, pl. 1*).—This study of the effect of the farming of land much of which is below the margin of profitable cultivation upon material conditions of family life completes the picture of economic conditions in Knott County, other phases of which have been noted (E. S. R., 68, pp. 393, 695; 72, p. 556). The combined study was a part of a comprehensive survey of economic and social conditions in the southern Appalachians, the report of which (E. S. R., 73, p. 264) contains a summary of the family living data presented in full in this publication.

It was found that the average money income from the farm was $56 per family per year for the entire 228 families studied, and that one-third of the number had no money income from this source. The money income from employment off the farm averaged $355 and from all sources $494 per family.

Over half of the living of the families was furnished by the farm, with food accounting for over 80 percent of the living. Food purchased also accounted for over one-third of the total money expenditure, and yet only 3 of 41 families for whom records of summer food consumption were kept had diets which could be considered adequate. Clothing expenditures and expenditures for formal education and medical care were very small.

The large families characteristic of the county are thought to be an important factor in the low levels of living. Many of the small farms represent patrimonies from the large families of preceding generations. With the family income so low, community resources have been inadequate to provide needed schools, roads, or recreational, sanitary, and medical facilities. Settlement schools supported in part by groups outside the county have done much to meet some of the needs often provided for by county governments in other rural areas.

"The Knott County situation, whether measured by the level of living of its population, or by its community facilities, is a product of the scant economic resources in relation to its population. With poor farm lands and with no industries sufficiently developed to provide supplementary employment, conditions like those described are almost unavoidable. In the main, the problems of the people in this section call for economic action on a scale greater than the individual family can undertake."

Selecting your gas stove, A. E. BARAGAR (*Nebraska Sta. Circ. 55 (1937), pp. 20, figs. 10*).—The technical information reported in Bulletin 86 (E. S. R., 77, p. 140) has been utilized as the basis for answers to the most important and typical inquiries received by the author in the past 2 yr. from prospective purchasers of gas stoves. The questions and answers are grouped under price, performance of cooking top, performance of oven and broiler, construction, significance of the American Gas Association approval seal, and appearance. As a further aid to purchasers, a rating chart is given covering the more important points to be considered. Photographs are also included of the different types of surface burners.

MISCELLANEOUS

Statistical methods, G. W. SNEDECOR (*Ames, Iowa: Collegiate Press, Inc., 1937, pp. XIII+341, figs. [21]*).—A concise presentation is given of the elements of statistical methods, with applications and treatment of data obtained in the analysis of agricultural and biological experiments. Special attention is given to small samples and the use of statistics by the scientist not especially trained in mathematics.

A research program: The Forty-third Annual Report of the Montana Agricultural Experiment Station [1936], F. B. LINFIELD (*Montana Sta. Rpt. 1936, pp. 56, figs. 9*).—In addition to a meteorological report for 1936 (pp. 36–38), the experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of [Nevada Station], 1936, S. B. DOTEN ET AL. (*Nevada Sta. Rpt. 1936, pp. 36, figs. 6*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of [Puerto Rico College Station, 1936], F. A. LÓPEZ DOMÍNGUEZ ET AL. (*Puerto Rico Col. Sta. Rpt. 1936, pp. 135*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Farm Research, October 1, 1937 (*Farm Res. (New York State Sta.], 4 (1937), No. 1, pp. 16, figs. 15*).—In addition to articles abstracted elsewhere in this issue, there are included Florida Dairying Found To Have Many Unique Features, by A. C. Dahlberg (pp. 2, 9); Improving Paper Milk Containers, by R. S. Breed (pp. 8, 15); Disease Content of Seeds Influences Planting Value, by W. F. Crosier (p. 11); and A Study in Yellow [Coloring Materials], by D. K. Tressler (p. 15).

NOTES

Colorado Station.—Dr. Mark A. Barmore, associate in home economics research, has resigned to become associated with the U. S. D. A. Bureau of Plant Industry as chemist in a project cooperative with the Kansas Station in the testing of new wheat varieties for their bread-making qualities.

Hawaii Station.—Leo D. Whitney, assistant agronomist since 1935, died November 7, 1937, at the age of 29 years. A native of California, he was graduated from the University of California in 1933 and served there in various capacities for short periods. His work in Hawaii had been mainly with taro and the native and introduced grasses.

Hawaii Sugar Planters' Station.—Dr. U. K. Das, research associate in charge of the biochemical laboratory, was killed by an explosion of laboratory apparatus on October 22, 1937. Dr. Das was born in India on July 23, 1902, and graduated from the University of Hawaii in 1927, receiving the M. S. degree there in 1930 and the Ph. D. degree from the University of Minnesota in 1935. He had worked mainly with sugarcane, studying among other phases the improvement of breeding technic and the effect of storage and nitrogen fertilization on cane quality.

Indiana Station.—Dr. George D. Scarseth, associate professor of soils in the Alabama Polytechnic Institute and associate soil chemist in the Alabama Station, has been appointed soil chemist in the agronomy department, with the rank of associate professor, replacing Dr. S. F. Thornton, resigned.

Kentucky Station.—Dr. H. J. Metzger, assistant animal pathologist, has resigned. J. B. Smathers has been succeeded as assistant field agent in cream grading by Noel L. Watson.

New Hampshire Station.—Ernest G. Ritzman, research professor in animal husbandry, has been appointed a research associate in animal nutrition in the Carnegie Institution. The appointment carries with it a direct grant of funds for the continuance of the projects previously supported by the institution at the station.

New Jersey Station.—Dr. R. P. White, research specialist in diseases of ornamentals, resigned December 31, 1937, to become executive secretary of the American Association of Nurserymen.

Vermont Station.—After certain bequests are paid and on the death of her son, the station is to receive the remainder of the estate of the late Alma S. Clemens, of Caledonia, N. Y., now valued at approximately $20,000.

Washington Station.—A 45-acre orchard tract has been purchased near Wenatchee for the location of a Tree Fruit Substation, authorized at the last session of the legislature. Part of this orchard has been used for many years for the fruit investigations laboratory at Wenatchee.

A. M. Neubert, assistant State chemist, has been appointed assistant chemist in the station vice Otto Johnson, resigned to carry on advanced work at the University of Minnesota.

West Virginia University and Station.—Dr. W. H. Pierre, head of the department of agronomy, has resigned to become head of the department of agronomy in the Iowa College and Station as of February 1.

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REGIONAL RESEARCH LABORATORIES UNDER THE AGRICULTURAL ADJUSTMENT ACT OF 1938

The Agricultural Adjustment Act of 1938, signed by President Franklin D. Roosevelt on February 16, is of immediate interest from the standpoint of agricultural research in that it makes specific provision for a series of regional research laboratories. Under the terms of the act the Secretary of Agriculture is directed to establish, equip, and maintain four such laboratories, one in each major farm producing area, and at these laboratories to "conduct researches into and to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts thereof." This research and development, it is provided, "shall be devoted primarily to those farm commodities in which there are regular or seasonal surpluses and their products and byproducts."

For the use of the laboratories, the Secretary is authorized to utilize in each fiscal year beginning with that of July 1, 1938, not to exceed $4,000,000. One quarter of this sum is to be allocated to each of the four laboratories. The Secretary is also authorized to accept in the name of the United States donations of property and services for the use of specific laboratories and to acquire land and interests therein. He is directed to "cooperate with other departments or agencies of the Federal Government, States, State agricultural experiment stations and other State agencies and institutions, counties, municipalities, business or other organizations, corporations, associations, universities, scientific societies, and individuals, upon such terms and conditions as he may prescribe." A report of the activities of, expenditures by, and donations to the laboratories is to be rendered by him to Congress at the beginning of each regular session.

As a further provision of this section of the act, allocation is also made to the Secretary of Commerce of $1,000,000 per annum "to be expended for the promotion of the sale of farm commodities and products thereof in such manner as he shall direct." For the initial year beginning July 1, 1938, $100,000 of this amount is to be devoted

to "making a survey and investigation of the cause or causes of the reduction in exports of agricultural commodities from the United States, in order to ascertain methods by which the sales in foreign countries of basic agricultural commodities produced in the United States may be increased."

Thus is brought to fruition a movement for the establishment and maintenance of institutions primarily devoted to studies of a wider utilization of farm products and byproducts which has been gathering headway for some time. It is of course in direct agreement with the objectives of the National Farm Chemurgic Council, and the underlying philosophy has found expression in such private benefactions as the recent Rackham Foundation trust endowment to the Michigan Experiment Station of $500,000, the income to be used for agricultural and chemurgic research, as noted on page 579.

The immediate forerunner of the legislation was doubtless the bill (S. 2140) introduced into Congress on April 12, 1937, by Senator Theodore G. Bilbo of Mississippi, providing for the establishment and maintenance of a regional research laboratory for the development of new uses of southern agricultural products, particularly cotton and cotton plant products, for the purpose of providing new markets for southern farm crops. In a radio address delivered soon afterward Senator Bilbo pointed out, in part, that "billions of dollars are annually being lost by the southern farmers because science has not yet come to their rescue by converting the byproducts of the southern farm crops into usable and commercial forms. A partial list of yearly southern farm products that now offer opportunity for further chemical research is as follows: Byproducts from cotton alone—18,000,000 tons of cotton stalks, about 5,000,000 tons of cottonseed, 1,200,000 tons of cottonseed hulls, and 1,000,000 bales of 500 lb. each of cotton linters; byproducts of waste and culls from other southern farm crops—15,000,000 bu. of culled sweetpotatoes, 1,500,000 tons of rice straw, 500,000 tons of sugarcane bagasse, 100,000 tons of peanut hulls, and undetermined amounts of tung-nut hulls and shells, pecan hulls and shells. And with all this the story is only half told. . . . Millions have been appropriated by Congress to improve plants and increase production, and the time has now arrived to give attention to the spending of a part of these millions in scientifically conducted research to discover new uses for this increased production and the fruits of these improved plants."

Senator Bilbo's bill was subsequently redrafted and introduced by him as S. 2789, which provided for the establishment and maintenance of a regional research laboratory for the development of industrial uses for southern agricultural products, the first unit to be devoted to the development of industrial uses for cotton and cotton

products. This bill passed the Senate on July 23, 1937, and was favorably reported by the House Committee on Agriculture August 16, but failed of enactment prior to adjournment of the session on August 21. However, S. J. Res. 207, approved by the President on August 23, expressed the sense of Congress that a permanent farm program should be enacted as soon as possible after reconvening, and that in this program, "linked with control of agricultural surpluses, there should be research into new uses for agricultural commodities and the products thereof and search for new uses, new outlets, and new markets at home and abroad."

The farm legislation referred to was duly considered in December, and each branch of Congress presented a plan for research along these lines. That of the House of Representatives authorized the use of not to exceed $9,000,000 per annum ($1,000,000 for the use of the Secretary of Commerce) for laboratories and other research facilities maintained by the Department of Agriculture itself or in cooperation with States appropriating not less than $250,000 for physical facilities. The Senate plan provided for four regional laboratories in the northeast, midwest, southern, and western regions, with a similar offset requirement of $250,000 and suitable land from the State in which each laboratory would be located, and made a total annual allotment of not to exceed $2,000,000 for the initial year. In conference the compromise plan already outlined was formulated and agreed to.

At the time of writing the many details of administration, location, organization, and program were receiving consideration by the Department in the hope of instituting active operations as soon as possible after the funds become available with the new fiscal year. Not the least of the problems to be met is that of cooperation and coordination with existing agencies, such as the Bureau of Chemistry and Soils of the Department, the regional research laboratories established under the Bankhead-Jones Act, and the activities of many of the State experiment stations. What is of greatest importance, however, is not the difficulties ahead but the fact that provision has now been made for a systematic and sustained attack on a specific and relatively restricted phase of agriculture on a scale never before possible. Evidently it is the duty and the opportunity of all agencies concerned to meet this new challenge as effectively as is in their power.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical research by the Delaware Station] (*Delaware Sta. Bul. 207 (1937), pp. 26, 27*).—G. L. Baker and M. W. Goodwin record observations on factors affecting the viscosity or plasticity of pectin and pectin-sugar solutions as an index of jell formation. An investigation of the extraction of phospholipoids from the soybean oil meal, by A. A. Horvath, has given some indication "that the phosphatides are held in the soybean in combination with the arginine fraction of the protein, either through a phosphoric acid-arginine linkage or through coacervation."

Simple kinetic theory of ionic exchange.—I, Ions of equal valency, H. Jenny (*Jour. Phys. Chem., 40 (1936), No. 4, pp. 501–517, figs. 7*).—"A simple model of the mechanism of ionic exchange" is proposed in this contribution from the Missouri Experiment Station, and with the aid of the model an exchange adsorption isotherm has been theoretically deduced. "The equation could be verified for colloidal clay systems over a considerable range of concentration.

"Certain systems are but poorly governed by the equation. This particular behavior is explained on the basis of structural peculiarities of the colloidal particles and extreme variations of the properties of the participating ions. The third root of the base-exchange constant is shown to be equal to the ratio of the electric potentials of the double layers. This relationship directly connects ionic exchange with problems of colloid stability."

Distribution and variation with maturity of dissolved solids, sucrose, and titratable acidity in the sorgo stalk, E. K. Ventre and S. Byall (*Jour. Agr. Res. [U. S.], 55 (1937), No. 8, pp. 553–562*).—The authors report as the result of an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils that "with the exception of the sprangle-top variety, Honey, which drops its seed and branches after ripening, with partial reversion in the upper internodes to the immature stage of maturity, and the Hodo variety, the juice of which was diluted by rain between the dough-to-ripe and dead-ripe stages of maturity, the following general trends were noted for the four varieties at different stages of maturity:

"The percentage of dissolved solids in the juice increases with maturity, and in the main progressively increases from the first to a maximum in the third or fourth internode, with a small progressive decrease in the lower internodes. There is a close correlation between the percentage of dissolved solids and the percentage of weight contributed by each internode.

"The percentage of sucrose in the juice increases from the first to a maximum in the third or fourth internode, and progressively and markedly decreases in the lower internodes. With maturity, the total percentage of sucrose in the expressed juice increases, and in the same relative proportion in the different internodes. The coefficient of apparent purity of the juice parallels closely the percentage of sucrose determined by polarization. It increases totally with maturity.

"If sorgo juices are to be used for the crystallization of sucrose, previously recommended topping practices are incorrect. The reverse procedure should be used, that is, the bottom internodes should be discarded, as they have relatively a much lower coefficient of purity. In some cases several internodes at the bottom of the stalk are much below he practical crystallization limits for sucrose. In the manufacture of sirup from the sorgo stalk, however, topping or discarding the three or four upper internodes reduces the tendency of the sirup to crystallize sucrose and also produces a sirup with a minimum of acidity or sharp 'tang.'"

The magnesium content of grasses and legumes and the ratios between this element and the total calcium, phosphorus, and nitrogen in these plants, H. A. Daniel (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 922–927*).—It was found at the Oklahoma Experiment Station that the average magnesium content of 19 species of mature grass was 0.156 percent and that of 45 mature legumes 0.379 percent. The grass varied in percentage of this element from 0.059 to 0.316 and the legumes from 0.329 to 1.024. The magnesium content of legumes decreased as the plants matured. The calcium : magnesium ratios varied in the mature grasses and legumes from 1.10 to 5.46, the phosphorus-magnesium ratios from 0.09 to 2.42, and the nitrogen : magnesium ratios from 2.09 to 22.06. The average of these ratios was slightly higher in the legume tops collected at different stages of growth than in the roots.

A study of gluten protein fractionation from sodium salicylate solution.—Part I, Durum wheat gluten fractionation, R. H. Harris (*Cereal Chem., 14 (1937), No. 5, pp. 695–707*).—At the North Dakota Experiment Station "wet crude gluten was washed from a preliminary set of 10 flours milled from various varieties of wheat, employing a 0.1 percent sodium phosphate solution of pH approximately 6.8. These glutens were then dispersed in 10 percent sodium salicylate solution and fractionally precipitated by the successive additions of 1, 2, 3, 5, and 10 cc of concentrated $MgSO_4$ solution. The fractions were removed by centrifuging following each addition. The results obtained showed great variability in quantity of protein separated by the different concentrations of $MgSO_4$ added. A large variation was also evident in the quantity of protein thrown down by the lower $MgSO_4$ concentration and indicated the possible importance of the initial fraction for purposes of gluten quality evaluation."

In a study of a further 30 samples of 70 percent patent experimentally milled flours produced from different varieties of North Dakota durum wheat of the 1936 crop, "the washed and dispersed glutens were fractionated by the addition of 3, 8, and 10 cc of concentrated $MgSO_4$ solution. The flours were also baked by two methods, the standard A. A. C. C. and a modified method using 2 hours' fermentation. A high positive correlation was found to exist between the loaf volumes yielded by these methods.

"Crude flour protein was not related to loaf volume, but wet crude gluten was significantly and positively related to both these variables. The quantity of protein removed initially by the addition of 3 cc of $MgSO_4$ proved to be correlated with loaf volume, whereas the other fractions did not have a relationship of any great importance with the size of loaf. The quantity of protein in fraction I did not vary with variation in flour protein. The combined relation between the two variables wet crude gluten and protein removed by 3 cc of $MgSO_4$ with loaf volume was relatively high and showed a gain of information with the knowledge of protein precipitated as fraction I in addition to the determination of wet crude gluten."

The denaturation of staphylococcal proteins, A. P. Krueger and V. C. Nichols (*Jour. Bact., 30 (1935), No. 4, pp. 401–409, figs. 3*).—The authors of

this contribution from the University of California made staphylococcal antigens by a mechanical fragmentation and ultrafiltration method and found them to contain less than 10 percent of the total bacterial protein in the denatured form. They further showed that "on exposure to heat staphylococcal native proteins are denatured, becoming insoluble at the isoelectric point (pH 4.6) and showing a considerable increase in SH groups. The denaturation reaction obeys the mass law and has a critical thermal increment averaging about 44,000. These data have practical implications in regard to the heat killing of bacteria for vaccines and also with respect to the conditions necessary for preservation of undenatured bacterial antigens."

Action of wheat amylases on raw wheat starch, M. J. Blish, R. M. Sandstedt, and D. K. Mecham (*Cereal Chem., 14 (1937), No. 5, pp. 605–628, figs. 6*).—An investigation carried out at the Nebraska Experiment Station has shown that "the 'raw starch amylase' can readily be extracted from flours with dilute sodium chloride solution. The extracts, when allowed to act, respectively, upon portions of the same raw starch, will hydrolyze the starch at different rates, and these different rates are found to fall into the same order as the rates observed in the autolytic digestions. Amylase preparations containing the raw starch catalyst can readily be prepared in concentrated form by precipitation with ammonium sulfate and dialysis of the precipitate, followed, if desired, by 'pervaporation' of the dialyzed extract, or they may be prepared merely by dialysis of the original flour extract, followed by pervaporation. The most highly active preparations are, of course, those from malted wheat flour. These preparations are stable and can be kept for long periods of time without significant loss of activity. The raw starch amylase is almost completely precipitated from malted wheat flour extracts by ammonium sulfate over a range of from 15 to 35 percent concentration of the salt. Fractionation studies showed it to be most highly concentrated in the range of 20 to 25 percent ammonium sulfate.

"A nonenzymic inhibitor, also a nonenzymic 'activator' of the raw starch factor have seemingly been identified in malted wheat flour extract. The former is dialyzable and is precipitated by saturated ammonium sulfate. The latter is not dialyzable and is not precipitated by ammonium sulfate.

"The raw starch amylase shows properties that appear to distinguish it definitely from α-amylase.

"The yeast-manometric method is a most convenient and trustworthy procedure for studying the activity of flour amylase extracts acting upon raw starch as a substrate, just as it has been found eminently suitable for autolytic flour amylase studies."

The rôle of bacteria and other microorganisms in the decomposition of cellulose in nature, S. A. Waksman (*Jour. Bact., 30 (1935), No. 4, p. 441*).—The author of this contribution from the New Jersey Experiment Stations finds that micro-organisms capable of decomposing cellulose occur among the fungi, actinomyces, and bacteria, the fungi active in this way including Ascomycetes, Hyphomycetes, and Basidiomycetes. The cellulose-decomposing bacteria comprise a number of aerobic, anaerobic, and thermophilic types which vary considerably both in their morphological and physiological characteristics.

"The mechanism of cellulose decomposition varies widely. It is assumed that the cellulose is first hydrolyzed to cellobiose and the latter to glucose. However, there are only few experiments on record where the production of glucose by cellulose-decomposing bacteria has actually been established. Many of the bacteria which decompose the cellulose synthesize considerable cell substance of a slimy nature and consisting largely of certain hemicelluloses belonging to the polyuronide type. The anaerobic bacteria decomposing cellulose produce a

variety of organic acids and alcohols, which can be utilized for industrial purposes."

Fermentation method for production of dextro-lactic acid, E. L. Tatum and W. H. Peterson (*Indus. and Engin. Chem., 27 (1935), No. 12, pp. 1493, 1494*).—The authors have isolated, at the University of Wisconsin, strains of lactic acid-producing micro-organism which develop only the dextrorotatory acid instead of the inactive mixture at present commercially available. The potential importance of the dextro acid as a food product and the possibility of its practical production on a manufacturing scale are pointed out. The acid can be made from the cheaper sources of sugar. In the authors' experiments, yields amounting to from 90 to 95 percent of the sugar fermented were obtained in a fermentation period of from 6 to 10 days.

Hydroxyfurans and their biological significance, W. F. Hoehn, C. H. Werkman, and H. Gilman (*Iowa Acad. Sci. Proc., 42 (1935), p. 119*).—At the Iowa State College, "hydroxyfurans, particularly the mono- and di-β-substituted types (prepared from furans and by ring closure procedures), have been examined biologically, particularly for their growth stimulation effects on bacteria, yeasts, and various higher plants."

The relation between the rate of enzymic oxidation and the stereochemical structure of ascorbic acid and its analogues, S. W. Johnson and S. S. Zilva (*Biochem. Jour., 31 (1937), No. 8, pp. 1366–1374, figs. 5*).—In continuation of the investigation previously noted (E. S. R., 77, p. 741), the authors studied the kinetics of the direct enzymic oxidation of compounds of the ascorbic acid series in which the oxygen ring engages an hydroxyl group to the right of the carbon chain and their enantiomorphs by the cucumber oxidase, using the Warburg respirometer.

The results show that the antiscorbutically active compounds which have the oxygen ring to the right of the carbon chain, *l*-, *d*-arabo-, *l*-gluco-, and *l*-galacto-ascorbic acid, were oxidized more rapidly than were the antiscorbutically inactive enantiomorphs, *d*-, *l*-arabo, *d*-gluco-, and *d*-galacto-ascorbic acid. It is suggested that "the asymmetry of carbon atom 5, therefore, conditions the antiscorbutic activity in these six carbon compounds to a marked extent but has no influence upon the kinetics of the enzymic oxidation process."

Changes in stored corn meal, C. O. Willits and F. J. Kokoski (*Indus. and Engin. Chem., 27 (1935), No. 12, pp. 1494–1496*).—At the New York State Experiment Station the authors have shown that corn meal may be stored for a long period of time without change in the crude fat content. It was found, however, that when the moisture content is 14 percent or higher, the storage temperature must be maintained at 18° C. (64.4° F.) or lower, whereas with a moisture content of less than 8 percent the storage temperature may be as high as 37°.

The "degrees of acidity" of corn meal do not indicate changes in crude fat and therefore may not be used as an index of crude fat losses.

Storing crackers, H. O. Triebold (*Pennsylvania Sta. Bul. 352 (1937), p. 21*).—Oat flour and extracts of oat flour were found to have a slight antioxygenic activity in preventing the oxidative deterioration of stored crackers.

Extraction of pectin from apple thinnings, H. W. Gerritz (*Indus. and Engin. Chem., 27 (1935), No. 12, pp. 1458, 1459*).—The author of this contribution from the Washington Experiment Station notes that "estimates have been made that 10 percent by volume of the total apple crop is lost each year as June drop and thinnings. This immature fruit contains large quantities of pectin-yielding material. . . . By treating this immature fruit with 0.5 percent hydrochloric, sulfuric, or tartaric acid, a large portion of the insoluble pectic substance is converted to soluble pectin of good gelling quality."

The best results were obtained by slicing the thinnings into 0.5 percent hydrochloric acid and pressing after 2 or 3 days' standing at room temperature. A second extraction with hot water yielded more pectin. "The pectin obtained either as the original solution, as a concentrated solution, or as a dried powdered pectin produced an excellent gel."

Canned crushed peaches, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 11, p. 328*).—The author describes a new product prepared on a practical scale and tested for salability at the University of California. Peaches riper than those suitable for canning as halves are used, and size is of no consequence. The fruit is lye peeled, sorted, trimmed, ground through 0.5-in. openings, and packed directly into the tins in the proportion three-fourths crushed fruit to one-fourth choice sirup of 40° Brix. Caution against overcooking is emphasized, the effect of too much cooking being to make the product a jam. The product proved popular when distributed for trial and the author recommends it to the canning industry.

[Utilization of lignin] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 94, 95*).—Progress results are briefly noted.

[Studies of analytical methods by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 352 (1937), pp. 42, 44, 45*).—Data are given on tests of a modified method for fat in sweetened dairy products, by W. D. Swope, and MacConkey's bile salt lactose broth and standard lactose broth compared as presumptive test media for water analysis, by M. A. Farrell.

Determination of specific gravity, E. A. Siebel and A. E. Kott (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 535–542*).—The weight of a specific gravity pycnometer varies with the air temperature and pressure because of change in the air buoyancy effect. For this reason the standard method for the determination of specific gravity requires frequent weighings of the empty pycnometer and of the pycnometer filled with water. If a counterweight is employed, changes in the air buoyancy effect are eliminated and only one weighing is needed for each determination.

A photoelectric colorimeter: Its application in the measurement of the concentration of colored substances in solution, F. M. Turrell and L. Waldbauer (*Iowa Acad. Sci. Proc., 42 (1935), pp. 63–66, figs. 3*).—A simple photoelectric colorimeter is described, and data which indicate the suitability of certain types of electrical current for operating the photocolorimeter are given. Data for potassium permanganate, nickel sulfate, and chlorophyll (a+b) solutions are presented.

A new procedure for determination of fluorine by the peroxidized titanium method, D. Dahle (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 505–516, fig. 1*).—This contribution from the U. S. D. A. Food and Drug Administration presents a new procedure for making fluorine determinations. A neutral wedge photometer is used for the colorimetric comparison, and the effectiveness with which aluminum salts inhibit the bleaching ordinarily caused by fluorine in a solution of peroxidized titanium is utilized. Experimental data, as well as typical results and applications, are given.

Factors affecting the determination of inorganic iron in small tissues, D. R. Borgen and C. A. Elvehjem (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 725–734*).—In continuation of a series of papers (E. S. R., 75, p. 743), the authors studied the available iron content of liver tissues of chicks and rats, using several modifications of the α,α′-dipyridine method of Hill (E. S. R., 64, p. 712).

It was found that the use of heat and homogenization tends to simplify the determination of inorganic iron in liver and other tissues and permit greater accuracy. The best reducing agents for the elimination of flavine interference

were found to be sodium hydrosulfite and thioglycolic acid. Regardless of the reducing agent used, the amount of ionizable iron in all samples from the same liver checked very well. Low values obtained when sodium pyrophosphate was added in addition to a reducing agent were found to be due to the formation of acid-insoluble iron pyrophosphate, which remains in the residue upon centrifuging or filtering. In the presence of thioglycolic acid the sodium pyrophosphate had no effect, which may have been due to the combination of the iron with the thioglycolic acid preventing the formation of the insoluble iron pyrophosphate. The results further substantiated the earlier work from the authors' laboratory that less than 70 percent of the iron in liver is present in the inorganic form.

A comparison of several methods for the determination of the neutralizing value of monocalcium phosphate, S. Klosky, K. H. Lorenz, and W. Corey (*Cereal Chem., 14 (1937), No. 5, pp. 687–694*).—The authors point out that the reaction between monocalcium phosphate, sodium hydroxide, or sodium bicarbonate consists of the formation of various phosphates "which subsequently reenter the reaction, thus making it complicated and subject to very slight variations of conditions apparently beyond the control of the chemist. Boiling the monocalcium phosphate with an excess of sodium hydroxide and back titration of this excess while hot to a certain pH value appears to be the only way of obtaining fairly reproducible results. However, as the indicator changes in color extremely slowly and the color to some extent is absorbed by the semigelatinous precipitate formed during the procedure, it is almost impossible to perceive the true end point of the titration." They propose a titration method in which 0.84 g of the monocalcium phosphate is boiled in a 200-cc volumetric flask with 100 cc of 0.1 N sodium hydroxide and about 10 cc of water. The solution is cooled, made up to 200 cc, and filtered. Of the filtrate 100 cc is treated with about 30 g of sodium chloride, 20 drops of thymol blue indicator solution are added, and titration with 0.1 N hydrochloric acid is carried "to a distinct yellow, using a standard sample for color comparison."

The relative solubility of soil phosphorus in different solvents, H. C. Millar, F. B. Smith, and P. E. Brown (*Iowa Acad. Sci. Proc., 42 (1935), pp. 99–102*).—In the study here briefly reported from the Iowa State College the reagents used were 0.002 N H_2SO_4 and a saturated solution of carbon dioxide. The influence of lime on the ability of these reagents to dissolve the soil phosphorus was investigated.

"Under atmospheric pressure sulfuric acid was more effective in dissolving soil phosphorus than a saturated solution of carbon dioxide. The results indicated that the phosphorus is not present in the different soils in the same form, and that the amount of phosphorus obtained by the different methods is a function of the form in which it is found in the soil. Subjecting a carbon dioxide solution to 50 mm of water pressure greatly increased its solvent effect on phosphorus, but this effect was greatly decreased by lime."

Use of silica dishes in Official method for determination of potash in fertilizers, H. R. Allen and L. Gault (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 1, pp. 101–104*).—According to some determinations made at the Kentucky Experiment Station, "silica dishes are satisfactory for use in the Official method for the determination of potash. Slightly higher results were obtained in silica than in platinum dishes. New silica dishes were used in this project and have since been used in routine analyses. Approximately 25 determinations have been made in each of 12 dishes, and no deterioration is noticeable on the surface of any of the dishes. A larger insoluble residue was left after the washing out of the K_2PtCl_6 salt than was found with the former Official method.

This residue was usually increased when organic material was present in the fertilizer. The residue was not affected by rewashing with the reagents used in the method."

Determination of urea nitrogen in fertilizer mixtures, J. Y. YEE and R. O. E. DAVIS (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 1, pp. 104–107*).—At the U. S. D. A. Bureau of Chemistry and Soils, six mixtures were prepared from a variety of nitrogen carriers and other fertilizer materials. These and eight other mixtures were analyzed by a urease method.

Most of the nitrogen carriers did not affect the determination of urea, but, in some cases where fish meal was present better results were obtained by leaching the sample of fertilizer and making the ammoniacal nitrogen and urea determinations on the leachate. This procedure is recommended for all fertilizer mixtures. The results obtained show close agreement between the quantities of urea added and those found, and excellent checks were obtained on three commercial fertilizer mixtures containing less than 0.5 percent urea.

Report on hydrocyanic acid in glucoside-bearing materials, R. A. GREENE and E. L. BREAZEALE (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 444–447*).—The authors present an associate referee's report from the Arizona Experiment Station recommending the adoption of a modified alkaline titration method, of a method depending upon photoelectric turbidimeters, and of a qualitative test for cyanogenetic glucosides. They further recommend dropping the prussian blue method because of difficulty in obtaining a stable suspension and other objectionable features, and they consider present colorimetric methods not to be worth further study, since they involve more manipulation and have no advantages over the titration method recommended.

***Effect of certain solvents and of sequence of extraction on the removal* of fat and ash constituents from the bones of chicks,** R. B. DUSTMAN (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 469–475*).—In a study reported from the West Virginia Experiment Station "acetone and ether removed approximately equivalent quantities of extractive. The ash content of the acetone extract was lower than that of the ether extract. Absolute alcohol and 95 percent alcohol removed considerably more extract and much more ash than did either acetone or ether. When absolute alcohol preceded acetone and ether as the first solvent the total extract was somewhat less than when the sequence was reversed. Ether or acetone used after 95 percent alcohol removed only very small quantities of extractives, but 95 percent alcohol used after ether or acetone removed much additional material."

Report on plants, O. B. WINTER (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 333–335*).—In this contribution from the Michigan Experiment Station, the referee discusses the relative merits of methods for determining iron, sodium, potassium, copper, iodine, and fluorine, and calls attention to the need for studying the applicability to plant materials of the various methods for the determination of minute quantities of lead. The desirability of a study of methods for estimating the hydrocyanic acid and inulin contents of plant material is also pointed out.

Quality in durum wheats and a method for testing small samples, C. C. FIFIELD, G. S. SMITH, and J. F. HAYES (*Cereal Chem., 14 (1937), No. 5, pp. 661–673, figs. 3*).—Concerning a newly devised test developed at the U. S. Department of Agriculture, the authors state, in part, that "samples of 100 g of wheat are milled and processed into flat, round macaroni disks which are used to estimate the color characteristics of the sample. The procedure follows closely the essential steps of the commercial process—milling, mixing, rolling or kneading, resting, pressing, and drying. . . . A specially designed small mixer, a miniature

pair of steel rolls, and a laboratory hydraulic press are used in processing the semolina into macaroni disks. The disks are dried between boards padded with corrugated paper. The disk color is analyzed on a colorimeter and reported in percentages of black, white, red, and yellow. . . .

"Moisture determinations made in an air oven run at 130° C. for 1 hr. showed a 1 percent greater loss of water from the unpressed disk than from the pressed disk. While the color of an unpressed disk was not affected by drying in an oven for 1 hr. at 130°, the pressed disks were distinctly caramelized, suggesting partial hydrolysis of the starch into dextrin.

"The macaroni disk test herein described was applied to some samples of durum wheat from which tubular macaroni had been made previously. Color analysis of the disks compared favorably with those of the tubular macaroni, and the varieties ranked in the same order as their known commercial value."

The determination of sucrose in flour, R. M. SANDSTEDT (*Cereal Chem., 14 (1937), No. 5, pp. 767, 768*).—In a ferricyanide reduction method devised at the University of Nebraska, "5 cc of the filtered, clarified flour extract (made according to the specifications for maltose determination) are pipetted into an 8-in. test tube and immersed in a vigorously boiling water bath. After 13 minutes' boiling the test tube and contents are cooled under running water and 10 cc of alkaline N/10 ferricyanide are added. The reduction of the ferricyanide and the subsequent titration are carried out as in the determination of maltose by the ferricyanide method. The ferricyanide reduced by the maltose in the flour is subtracted from the value obtained after hydrolysis, and the sucrose represented by the difference is obtained from the ferricyanide sucrose table." The table to which reference is made covers the range from 0.1 to 8.5 cc of 0.1 N ferricyanide in steps of 0.1 cc and from 5 to 407 mg of sucrose.

Detection of gums in certain food products, F. L. HART (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 527–534*).—In this contribution from the U. S. D. A. Food and Drug Administration methods for the detection of agar-agar in mayonnaise, gums in soft-curd cheeses, gums in ice cream and ice cream mixes, agar-agar in canned chicken, and soluble gums in tomato products are outlined. The new principle involved in the procedure is that of the removal of proteins by precipitation with trichloroacetic acid, a precipitant which, unlike tannic acid and some other protein precipitants, does not carry down the gums as well as the proteins.

Report on lactose in milk, E. R. GARRISON (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 343–348*).—The author, as associate referee from the University of Missouri, concludes "that 5–6 cc of acid mercuric nitrate solution per two normal weight of milk instead of 1 cc is required to adequately clarify milk for the determination of lactose by the optical method; that 15–18 cc of acid mercuric nitrate solution prepared by dissolving mercury in twice its weight of nitric acid and diluting with five volumes of water is preferable to the use of 5 or 6 cc of the A. O. A. C. solution; that the addition of 20 cc of a 5 percent solution of phosphotungstic acid per two normal weight of milk gives slightly higher saccharimeter readings, especially for abnormal milk, than the use of acid mercuric nitrate alone."

The colorimetric determination of lactic acid in milk and milk products, F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 1, pp. 130–141, figs. 2*).—The author has adapted a colorimetric method, dependent upon the color reaction of lactic acid with ferric chloride, and previously used by him for determining the lactic acid content of tomato products (E. S. R., 78, p. 299), for the determination of this acid in milk products and butter. It was necessary to enlarge the liquid extractor used sufficiently to permit the treatment of 50 cc of solution.

The proposed procedure could be carried through in 1 day, and as small a quantity as 10 p. p. m. of lactic acid could be determined.

Detection of decomposition products in butter and cream, J. O. Clarke, J. H. Cannon, E. W. Coulter, M. S. Goodman, W. S. Greene, K. L. Milstead, R. L. Vandaveer, and J. D. Wildman (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 475–505, fig. 1*).—In a contribution from the U. S. D. A. Food and Drug Administration, the authors present the results of a detailed investigation of possible indices of decomposition in commercial cream and butter.

"Lactic acid fermentation of cream with pure cultures occasions no increase in indole and only insignificant increases in acidity of fat in the butter made therefrom. Obviously cream subjected to pure lactic acid fermentation could show no mold content. Decomposition induced by inoculation of sterile cream with decomposed cream effects increases in acidity of fat and mold and may cause an increase in indole. All indices, for both cream and for the butter made therefrom, increase as commercial cream is exposed for increasing periods to an environment favorable to decomposition. The increase is more rapid the higher the temperature of storage. After extreme decomposition begins these indices may show a slight decrease. In many cases butter made from decomposed cream will show high values for indole, acidity of fat, or mold. No significant change in indole, acidity of fat, or mold was noted in butter under conditions duplicating commercial shipping or storage."

Report on stock feed adulteration, P. B. Curtis (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, p. 434*).—Contributing from the Indiana Experiment Station, this associate referee reports a preliminary investigation of methods for the detection and estimation of rock phosphate adulteration in mineral feeds. The use of the neutral ammonium citrate solution as applied in fertilizer analysis was apparently practicable for relatively large percentages of adulteration, whereas the determination of the fluorine content appeared more useful for estimating small percentages of added rock phosphate.

The ascorbic acid determination in the urine [trans. title], W. Tschopp (*Hoppe-Seyler's Ztschr. Physiol. Chem., 244 (1936), No. 1–2, pp. 59–77, figs. 6*).—In this comparison of various methods of determining ascorbic acid in the urine, solutions of ascorbic acid in varying concentrations, alone and with glutathione and cysteine, were first tested. The methods found suitable with these mixtures were then applied to urine, including tests of the stability of the ascorbic acid under various conditions of temperature and with different stabilizing agents.

Titration with 2,6-dichlorophenolindophenol at pH 2.7 was considered most satisfactory. The results obtained before the ingestion of test doses of ascorbic acid are considered to be nonspecific but the increase after test doses to be a true measure of vitamin C. The urine must be tested as fresh as possible, but with the addition of 8–10 percent of glacial acetic acid it can be kept satisfactorily on ice for about 2 hr. The urine can be diluted 1:5 or 1:10 with distilled water if too strongly colored.

A list of 38 references to the literature is appended.

Sources of error in the determination of the diastatic power of malt, H. R. Sallans and J. A. Anderson (*Cereal Chem., 14 (1937), No. 5, pp. 708–720*).—The authors have investigated sources of error in the determination of the diastatic power of malt by the Official method of the American Society of Brewing Chemists. The standard error for the mean of duplicate determinations made in different laboratories is estimated as ±4.7° Lintner for a malt of 100°.

"The main sources of error are: Standardization of procedure and solutions for determining reducing power ±3°, selection of soluble starch ±3°, setting tolerance for temperature of water bath ±1.4°, and sampling ±1° Lintner."

Determination of isopropyl alcohol by immersion refractometer, J. Batscha and S. Reznek (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 1, pp. 107–115*).—The authors of this contribution from the U. S. D. A. Food and Drug Administration have prepared a table for calculating the percentages of isopropyl alcohol in mixtures of isopropyl alcohol and water from the Zeiss immersion refractometer readings at 20°–25° C., and a table showing the relation between specific gravity at 20°/20° and 25°/25° and the isopropyl alcohol content of mixtures of isopropyl alcohol and water.

A comparison of several physical methods for the determination of the alcohol content of wine, M. A. Joslyn, G. L. Marsh, and J. Fessler (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 1, pp. 116–130, fig. 1*).—From a considerable number of determinations, including collaborative work, the authors of this contribution from the University of California conclude that "with suitable precautions the alcohol content may be determined to ±0.1 percent by pycnometer and ±0.2 percent by ebullioscope. If the results do not fall into these ranges they are definitely in error."

Report on accelerated weathering test of paints, L. L. Carrick (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, p. 350*).—Contributing from the North Dakota Agricultural College, the author concludes that such weathering tests as are here considered must be adapted to local climatic conditions and specifies the cycle of exposure treatments which he has found best suited to the climate of North Dakota.

AGRICULTURAL METEOROLOGY

Weather elements, T. A. Blair (*New York: Prentice-Hall, 1937, pp. XV+401, figs. 107*).—This book is designed as a text in elementary meteorology, its purpose being to present concisely and systematically an introduction to the science in its present stage of development, setting forth the facts and principles concerning the behavior and responses of the atmosphere in such a way as to provide an elementary understanding of the physical processes underlying observed weather phenomena. A chapter on climate and man contains a section on agricultural meteorology, dealing briefly with climate and crops, weather and crops, droughts, and phenology. A considerable bibliography is appended.

Weather forecasting, C. F. Brooks (*Jour. Boston Soc. Civ. Engin., 24 (1937), No. 4, pp. 305–322, figs. 12*).—The basic principles and factors controlling weather changes and forecasting are briefly explained, and efforts to improve daily and long-range forecasts are described. Of long-range forecasting the author says "the outlook for long-range weather forecasting seems hopeful, even though much of the success of optimistic scientific long-range forecasters seems on statistical scrutiny to have been due to chance as much as to science. There can be no doubt that there are major and minor swings in the earth's weather, and that these are interconnected over wide areas and persist and progress in definite manner from one season to another. We do not yet fully understand the causes of these swings. The small fluctuations in the radiation received from the sun may initiate these fluctuations, which are then continued by natural periods in the earth's atmosphere and hydrosphere. There are slow changes in ocean temperatures and the movement of bodies of water of varying temperature. There are the changes in the amount of ice in the Arctic regions, the variations in the land area covered with snow in winter,

which exert an important influence on the distributions of air temperature and consequently of pressure. The sequences and persistences of these variations can be discovered statistically, but until we have a longer record of the weather to work with, their reality cannot be proved by statistical means. Nevertheless, when the relations found can be explained with considerable confidence on the basis of physical interrelations, then we may believe that an adequate basis for long-range forecasts has been found."

Balloons for weather forecasting, C. B. PEAR, JR. (*Sci. Digest, 3 (1938), No. 1, pp. 5–7*).—This article describes briefly the construction and operation of the radio-meteorograph, "a very light instrument carried by 4-ft. balloons and employing a radio transmitter which sends back the record as fast as its component instruments measure it." It is stated that this device can be made to do all that the airplane can and more. It is, therefore, considered preferable to airplane flights for the same purpose.

Weather conditions and services (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 76–81*).—The services of the U. S. Weather Bureau with reference to flood control; drought, frost, cold-wave, forest-fire, and hurricane warnings; and to aviation are briefly described.

Report of the Chief of the Weather Bureau, 1937, W. R. GREGG (*U. S. Dept. Agr., Weather Bur. Rpt. 1937, pp. 16*).—This brief administrative account of the work of the Weather Bureau during the fiscal year ended June 30, 1937, deals with recent progress in meteorological research, improvements in equipment, aerological observations, service in aid of air navigation, expansion of the fire-weather service and the river and flood service, progress in marine meteorology, hurricane warning service, horticultural protection, and reviews the year's weather, especially the Ohio and lower Mississippi Valley floods of January–February 1937.

Sources of moisture for precipitation in the United States, B. HOLZMAN (*U. S. Dept. Agr., Tech. Bul. 589 (1937), pp. 42, figs. 10*).—It is stated that "the supply of moisture for precipitation over the United States is derived principally from maritime air masses that obtain their moisture mainly from evaporation from oceanic provinces, only a very small part being attributable to continental evaporation. The balance of water on continental areas is maintained through the hydrologic cycle, which operates simultaneously with a cycle of air masses. Maritime air bodies invade the continents and drop a large portion of their moisture. Part [roughly, one-fourth] of this water is then returned to the oceans by run-off through rivers and underground water flow and the remainder is ultimately returned to the atmosphere by evaporation. . . . The principal amount of moisture returned to the atmosphere by continental evaporation is absorbed by continental, or dry, air masses that are generally incapable of immediately releasing their moisture and that pass off continental areas with large gains in moisture. The process of precipitating atmospheric moisture is known to depend upon several variables, and no simple procedure involving solely an increase in atmospheric moisture can be expected to increase local or other rainfall. The absolute quantity of moisture in the atmosphere has been shown to have no immediate relation to the quantity of rainfall any given climatic province may receive. Climatic regions whether arid or humid belong to their respective categories not because of the availability of moisture in the atmosphere or their nearness to a supply of moisture, but primarily because of their geographical orientation with respect to the atmospheric circulation system."

Evaporation from free water surfaces, F. G. MILLAR (*Canada Dept. Transport, Air Serv. Branch, Canad. Met. Mem., 1 (1937), No. 2, pp. 39–65, figs. 9; abs.*

in Sci. Abs., Sect. A—Phys., 40 (1937), No. 478, p. 1031).—Results of wind tunnel and other recent experiments are discussed from an empirical point of view. "The theory of turbulent mass exchange is used to develop equations for evaporation from both finite and infinite free water surfaces. The formulas obtained are in agreement with the principle of dymanic similarity, are claimed to be of more general application than the usual power laws, and are verified by the observational material for a wide range in the size of surface." The apparatus used and the procedures followed in deducing the formulas are described in some detail.

SOILS—FERTILIZERS

[Research in soils and fertilizers] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 92–94*).—This work is very briefly summarized under the captions application of soil studies, deficiencies of some soil types, selenium in soils, and analysis of fertilizers.

[Soil investigations by the Delaware Station] (*Delaware Sta. Bul. 207 (1937), pp. 18–20, 26, 27, 45, 46*).—The report contains brief notes on the effect of lime on the availability of potash in soils, and erosion surveys, both by H. C. Harris; the effect of degree of base saturation (with Ca ion) upon fixation and availability of phosphorus and potassium in soils, by G. M. Gilligan; and the influence of the minor elements on the soil flora, by T. F. Manns, W. L. Churchman, and M. M. Manns.

[Soil investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 352 (1937), pp. 26–29, fig. 1*).—The present report contains brief notes on a mineralogical study of Pennsylvania soils, by C. D. Jeffries; fertilizer needs after tile drainage of Volusia soils and use of lime on Jordan fertility plats, both by J. W. White and F. J. Holben; effect on soil erosion of tillage with v. across the slope, by N. F. Farris; methods for soil tests, by F. G. Merkle; and test of phosphates and results on the Jordan soil fertility plats, both by C. F. Noll and C. J. Irvin.

[Soil investigations by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1936, pp. 80–86, fig. 1*).—The following statements summarize the paragraphs of which they are captions: Puerto Rico has large areas of unproductive soils derived from serpentine; phosphoric acid fertilizer was essential for sweet corn on Las Mesas; phosphoric acid increased number and weight of marketable ears; phosphoric acid apparently hastened tasseling of sweet corn; growth measurements of sweet corn also showed response to phosphate; heavily eroded unproductive volcanic soils were made productive; phosphoric acid applications were essential for production of corn forage at Las Mesas; nitrogen applications also gave increased yields on Las Mesas soils; potash added to phosphoric acid gave significantly increased growth; Las Mesas soils are not acidic; these unproductive soils showed favorable nitrogen content; phosphoric acid is the nutrient which is critically deficient; lime:magnesia ratio was very low; silica content was low, iron very high; aluminum excess apparently was not cause of unproductive nature of soil; and Las Mesas soils showed high clay content.

Soil survey manual, C. E. KELLOGG (*U. S. Dept. Agr., Misc. Pub. 274 (1937), pp. 136, pls. 11, figs. 16*).—"This manual is intended for the use of soil surveyors in the field, particularly those engaged on projects of, or cooperative with, the Bureau of Chemistry and Soils." Detailed directions for every phase of the work are given, including the purpose and character of the soil map and report, preparations for field work, construction of the soil-mapping legend, preparation of the base and soil maps and of the soil survey report, collection

of soil samples, estimation and mapping of salts or alkali in the soil, and inspection and correlation.

The high degree of accuracy of the improved soil hydrometer used in the mechanical analysis of soils, G. J. Bouyoucos (*Soil Sci., 44 (1937), No. 4, pp. 315–317*).—In an investigation carried out at the Michigan Experiment Station, the author has shown that "the soil hydrometer when placed in a soil suspension that has been allowed to settle in order to produce differences in density with depth indicates the same quantity of soil present as that in the same suspension when it is siphoned off and mixed to produce conditions of uniform density. Furthermore, the amount indicated is the same, within limits of experimental error, as that found by gravimetric determination. These are important facts and establish conclusively that the hydrometer method is practical and accurate. At the same time they prove that certain criticisms of the method based on theoretical considerations are invalid."

A comparison of glass and quinhydrone electrodes for determining the pH of some Iowa soils, H. L. Dean and R. H. Walker (*Iowa Acad. Sci. Proc., 42 (1935), pp. 105, 106*).—The "quinhydrone error," or alteration of pH due to the addition of the quinhydrone, and the "quinhydrone electrode error," or difference between quinhydrone electrode figures and figures given by the glass electrode in the presence of quinhydrone, were both shown to be of small importance in pH determinations in the Iowa soils studied. Little change due to standing occurred until after from 6 to 12 hr., so that this source of error, also, was considered to be of small practical importance.

Particle size in relation to base exchange and hydration properties of Putnam clay, D. M. Whitt and L. D. Baver (*Jour. Amer. Soc. Agron., 29 (1937), No. 11, pp. 905–916, figs. 4*).—At the Missouri Experiment Station "observations made during the separating processes led to the conclusion that particles the size of those separated in this study are stable under rather drastic dispersion treatments. Whether primary particles alone were obtained cannot be definitely determined without further investigation. It is believed, however, that the repeated stirring and peptization of the various separates destroyed the major portion of the aggregates, and that any aggregates present after dispersion were nearly as stable as the primary particles. . . .

"Many sizes have been suggested for the upper limit of colloidal size in soils. Most of these limits have been set up arbitrarily, while others have been based on experimental data. The results of the study with Putnam clay indicate clearly that the particles below 1μ possess very different properties from the particles above this size. The fraction between 1μ and 0.5μ was almost entirely absent in this soil, but by interpolation its properties can be obtained.

"The property of swelling . . . is not present in particles greater than 1μ, and the maximum toluene adsorption takes place in the same particle size range. The wide break in exchange capacity is also very near this point. . . .

"If the upper limit of colloidal size is taken, first, as that point below which physical and chemical properties are very nearly the same, and second, where a distinct break occurs in the curve showing the different preperties of the clay as a function of particle size, then, on the basis of the few properties determined in this investigation, 1μ is not far from the upper limit of colloidal size in the Putnam silt loam. Additional study is needed before the full importance of particle size is realized."

Chemical composition of soils of Texas, G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 549 (1937), pp. 87, figs. 12*).—The analyses of several thousand samples of soils were averaged by types for about 100 of the most important

soil series of Texas. The constituents of these soils as averaged by types are classified in five grades according to the quantities present, grade 1 being the highest. Tables show the composition of the various soils averaged by types and their grades.

The bulletin also contains maps showing the prevailing grades of such of the constituents and properties of the upland surface soils in the various parts of the State as total nitrogen, active phosphoric acid, total phosphoric acid, active potash, acid-soluble potash, total potash, acid-soluble lime, basicity, acidity, and acid-soluble magnesia. These maps show that wide areas of Texas soils are low in phosphoric acid and in nitrogen, especially in the eastern part of the State. Potash is present in larger quantities than phosphoric acid. Lime is high in areas in the central and western part of the State, but low in some areas in the eastern part, and some of the soils in these areas may become sufficiently acid to require liming. Texas soils are not likely to be deficient in magnesia. Alluvial soils are better supplied with plant nutrients than upland soils.

The nitrogen, phosphorus, and organic carbon content of Iowa soils, P. E. BROWN and R. H. WALKER (*Iowa Acad. Sci. Proc., 42 (1935), p. 105*).—It has been shown at the Iowa State College that "the average carbon : nitrogen ratio for the loessial soils was 11.93, and for the drift soils it was 12.67. The average composition of the loessial soils to a depth of 6⅔ in. is 1,183 lb. of phosphorus, 3,510 lb. of nitrogen, and 41,386 lb. of organic carbon per acre. The average composition of the drift soils to the same depth is 1,208 lb. of phosphorus, 3,640 lb. of nitrogen, and 44,980 lb. of organic carbon."

The composition of inorganic colloids extracted from three Iowa soils, H. C. DEAN, F. B. SMITH, and P. E. BROWN (*Iowa Acad. Sci. Proc., 42 (1935), pp. 103, 104*).—The authors of this contribution from the Iowa State College here present the results of an examination of the colloid content of Tama silt loam and of the clay loam and silty clay loam of the Webster series, the pH values of the three soils being, respectively, 5.53, 6.89, and 7.60; their total colloid contents 48.72, 50.89, and 36.72 percent, respectively; and their inorganic colloid content 45.26, 44.27, and 32.38 percent, respectively. The silica, alumina, ferric oxide, titanium dioxide, phosphoric anhydride, and available potassium (calculated as the oxide) are given for the inorganic colloid of each of the three soils.

Colloidal properties of soil organic matter, L. D. BAVER and N. S. HALL (*Missouri Sta. Res. Bul. 267 (1937), pp. 23, figs. 13*).—From detailed investigations of such physicochemical characteristics as specific conductivity and migration velocities, viscosity and hydration, flocculation, release and adsorption of exchangeable cations, and reversibility, the authors conclude that "colloidal humus behaves like a highly hydrated suspensoid. Hydration is of major importance in the stability of divalent humus sols. The high hydration of humus places it between colloidal clay and bentonite with respect to most of its properties.

"The relatively high energy of adsorption and low flocculating power of the Mg ion with respect to organic matter suggests a possible explanation of the formation of Mg Solonetz soils. Mg humates would be mobile, especially in the presence of small amounts of alkali cations.

"The higher reversibility of dehydrated Ca humus as compared with H humus points out the possibility of the migration of organic matter to relatively great depths in Pedocal soils. Since Ca- and H-saturated humus have similar properties relative to flocculation and since Ca humates are more reversible in water than the corresponding H systems, it would seem that the importance of calcium in the nutrition of plants in the production of vegetation

is a more significant factor in organic matter accumulation than has hitherto been recognized.

"The fact that the properties of the Ca- and H-saturated systems of colloidal clays as well as colloidal humus are not significantly different indicates quite strongly that the content of organic matter in soils is more important for stable structure formation than its percentage saturation wih calcium."

Variation in soils with respect to the disposition of natural precipitation, R. S. Stauffer and R. S. Smith (*Jour. Amer. Soc. Agron., 29 (1937), No. 11, pp. 917–923, figs. 3*).—The authors of this contribution from the Illinois Experiment Station report upon the setting up of lysimeters of a type designed to permit both run-off and percolation rate determinations, since it is considered that "the infiltration capacity of soils is one of the properties about which more information is needed upon which to build erosion control practices." Some data from 18 months' operation are reported, but the paper is devoted mainly to a description of the equipment, the experimental methods, and the eight soils used.

A preliminary report of an infiltration study of some Piedmont and Coastal Plain soils, G. R. Free and G. W. Musgrave (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-TP-13, pp. [10], pls. 5*).—Studies conducted by the Soil Conservation Service on the infiltration rates of Ruston sandy loam, Greenville sandy clay loam, Susquehanna clay loam, and other typical Piedmont and Coastal Plain soils are reported in a preliminary way.

The Cecil sandy loam, sandy clay loam, and clay loam represent three different degrees of erosion found on the Watkinsville, Ga., site. While the Cecil sandy loam is undoubtedly eroded to some extent, it nevertheless has an A horizon 11 in. thick. The Cecil sandy clay loam with a 3-in. depth of A horizon represents an intermediate degree of erosion, while the Cecil clay loam has been subjected to severe erosion which has entirely removed the sandy surface cover. The total infiltration during the 3-hr. period on those three soils was 1.65, 1.26, and 0.28 in., respectively. It is clear that the presence of the coarse material of the original A horizon is in this instance associated with a high rate of penetration of water into the soil.

Total infiltration during the 3-hr. period on the Davidson soil was 2.47, while on the Iredell it was only 0.04 in., an amount insignificant from the viewpoint of any practical effect upon erosion control practices. Clearly, control measures on the Iredell must be designed to care for greater quantities of water than those on the Davidson soil.

The Ruston sandy loam with 8 in. of A horizon, the Greenville sandy clay loam with 3 in. of A horizon, and the Susquehanna clay loam with 4 in. of A horizon gave infiltration which totaled 6.18, 0.60, and 0.29 in., respectively, for the 3-hr. period.

Results also are reported of turbidity tests on Ruston and Davidson soils.

Rate of flow of capillary moisture, M. R. Lewis (*U. S. Dept. Agr., Tech. Bul. 579 (1937), pp. 30, figs. 13*).—In this study, cooperative with the Oregon Experiment Station, the author set up series of soil columns exposed to the evaporating influence of an air current at one end and added water at predetermined rates at the other end. When a state of steady flow was secured the soil columns were broken down and moisture content of each short transverse section was determined. That approximately steady flow had been attained was determined by weighing the tubes before and after adding water each time and plotting the rate of loss. The rate of loss became and continued approximately uniform and equal to the rate of addition, showing that dynamic equilibrium had been reached.

In general, "these data show that between approximately the field capacity and the wilting point the several soil types will transmit 1 in. of water

through 1 to 4 in. in 8 to 20 days. From these data it is obvious that with differences in moisture content between the field capacity and the wilting point water in sufficient quantities to support crops could be raised a few inches from a moist subsoil, but only a few inches. Examination of the curves shows that most of the movement takes place at moisture contents well above the wilting point. Losses by evaporation at the soil surface of water moved upward by capillary action are not great. The portion of the soil mass midway between absorbing roots might be well below the field capacity but still well above the wilting point before the movement of moisture through the soil would become the limiting factor in tree or fruit growth. At moisture contents below the wilting point the moisture-content gradient is extremely steep for the rates of flow used in this experiment. . . . At high relative moisture contents and with low rates of flow water may move through considerable distances. At low relative moisture contents the distance through which moisture will move is very small."

The problems and needs of soil conservation, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-MP-18, pp. 13*).—This is an address on the subject presented at the Annual Conference of Extension Workers at Purdue University, October 7, 1937.

Relation of soil conservation to control of floods and silting, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-MP-17, pp. 7, pls. 4*).—This is a brief general statement on the subject presented at the National Rivers and Harbors Congress held in Washington, D. C., on April 26, 1937.

Progress in the adoption of selected erosion control practices, Coon Creek area, Wisconsin (1933–1936), M. H. Cohee and J. C. Jensen (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-RB-5, pp. [1]+37, pl. 1*).—The results of this survey are presented and discussed.

Soil and water conservation in the northern Great Plains (*U. S. Dept. Agr., Soil Conserv., Serv., 1937, pp. 19, figs. 18*).—The purpose of this booklet is to analyze and explain the forces of erosion and to describe the conservation farming practices which the Soil Conservation Service is using in demonstration areas in the northern Great Plains region.

Anchoring farmlands in the Ohio Valley region, J. S. Cutler (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, pp. 18+[2], figs. 19*).—This is a brief general statement of methods suggested by the Soil Conservation Service for the control of soil erosion in the Ohio Valley region.

Conserving Corn Belt soil, G. K. Rule (*U. S. Dept. Agr., Farmers' Bul. 1795 (1937), pp. [4]+59, figs. 34*).—This publication treats in a general manner of erosion as a contributing cause to the decline of the natural productiveness of Corn Belt soils. Erosion practices now employed on the project areas of the Soil Conservation Service are discussed.

Saving Virginia soils, L. Carrier et al. (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-RB-4, pp. [2]+23, pls. 5*).—Practical information is given on mechanical, agronomic, and other means of preventing the loss of Virginia soils by erosion.

Survey of soil conservation practices in central west Tennessee, C. E. Allred, B. H. Luebke, and B. T. Lanham, Jr. (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 59 (1937), pp. VII+48, figs. 13*).—This report has been prepared by the Tennessee Experiment Station in cooperation with the Bureau of Agricultural Economics, the Agricultural Adjustment Administration, and the Soil Conservation Service of the U. S. Department of Agriculture. It reports a farm management survey of a total of 150 farms typical of central west Tennessee, the purpose being to show the prevailing type of soil conserva-

tion practices. Over 98 percent of the farms surveyed in the area reported some kind of conservation practices.

[Soil erosion prevention studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1936, pp. 2, 16, 17–22, 23, figs. 5*).—Progress results of this work are presented. It has involved both the mechanical and the agronomic approach. Terracing, canalization, and soil-saving crops are among the topics discussed.

Orchard soil management practice in New England, G. F. POTTER (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 80–86; also in Conn. Pomol. Soc. Proc., 45 (1935), pp. 83–89*).—The author of this contribution from the University of New Hampshire presents a discussion of sod culture as compared with clean cultivation as a means of maintaining desirable soil conditions in orchard practice. The value of mulch is also emphasized.

Soil management practice in New Jersey, M. A. BLAKE (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 77–80; also in Conn. Pomol. Soc. Proc., 45 (1935), pp. 80–83*).—A brief contribution from the New Jersey Experiment Stations indicates the following as outstanding trends in New Jersey orchard soil management: "(1) Soil tests and nutrient treatments which will make certain that no deficiencies occur in calcium, magnesium, phosphorus, nitrogen, and potash. (2) Development and use of standards by means of which the growth status of the various varieties of apples can be determined at any time of the year. (3) The adoption of sweet clover or alfalfa as soil improvement crops in apple orchards grown over the entire area or in alternate row spaces as conditions warrant. The use of an organic form of mulch in addition and other practices to obtain the desired tree response."

Soil management practice in Pennsylvania, R. D. ANTHONY (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 73–77; also in Conn. Pomol. Soc. Proc., 45 (1935), pp. 73–77*).—Among the points emphasized in this contribution from the Pennsylvania Experiment Station are the importance of deep soils and sufficiently wide spacing of trees to insure moisture supply in dry years and the value of sod cover in preventing serious run-off and erosion. An increase in the rate of application of nitrogenous fertilizers is noted, as is also an increasing use of ammonium sulfate and cyanamide.

Synthetic soil as a medium for the study of certain microbiological processes, M. R. MADHOK (*Soil Sci., 44 (1937), No. 4, pp. 319–322*).—In reporting from the New Jersey Experiment Stations upon this investigation of an artificial medium for the growth of soil micro-organisms, the author points out that liquid or agar media "not only differ in physical nature from the soil but they also provide nutrients that differ in nature and concentration from those that occur in or are added to the soil." In the use of sterilized soil, "because of the changes brought about during sterilization, not all the results obtained are helpful in determining the influence of various factors on microbial activity."

In an attempt to prepare a synthetic medium similar to natural soil but simple enough to make possible clear interpretations of the findings, sand and bentonite were combined in proportions similar to those of sand and clay in an average loam, 97.5 : 2.5. Tests with respect to its suitability as a substrate for some of the more important soil processes, such as cellulose decomposition, nitrification, and nitrogen fixation, indicated that "the sand-bentonite medium has distinct advantages over artificial liquid media as well as over pure sand media for the study of certain soil microbiological processes, because it is more nearly similar to a natural soil, yet it is simple in composition. Furthermore, it can be readily duplicated. The results obtained by the use of this medium can be interpreted readily in terms of soil processes."

Preliminary investigation of the occurrence and distribution of Azotobacter in the soils of Iowa, W. P. MARTIN and R. H. WALKER (*Iowa Acad. Sci. Proc., 42 (1935), pp. 55–61*).—Because *Azotobacter* cannot, apparently, compete with other micro-organisms and with higher plants for soil nitrogen and does not itself fix atmospheric nitrogen at a reaction more acid than about pH 6, acidity is an important limiting factor, "but . . . other factors more or less controlled by the pH or associated with it may also be of importance. Especially may this be true in the case of phosphate. It is also important that emphasis be placed upon the fact that even though the *Azotobacter* may be present in a soil, they may not fix any nitrogen, in which case sufficient fixed nitrogen is present to supply the needs of the organisms. Nevertheless, the desirable *Azotobacter* do not seem to occur extensively in the soils of Iowa. Perhaps soil inoculation with the *Azotobacter* after the addition of sufficient time to raise the pH of the soil above a pH of 6.0, together with a soluble phosphate fertilizer, may be practiced in Iowa."

This is a contribution from the Iowa Experiment Station.

The numbers of Nitrosomonas in some variously treated Iowa soils, R. H. WALKER, A. A. KLINGEBIEL, and L. M. GREINER (*Iowa Acad. Sci. Proc., 42 (1935), p. 89*).—The authors of this note from the Iowa State College find that the number of *Nitrosomonas* in soils varies considerably. "The number present in soils is undoubtedly affected by such factors as the fertilization, cropping, and cultivation; the organic matter content; the H-ion concentration; the moisture content of the soil; and the season of the year. The pH and buffer capacity of the soil are probably major factors in determining the numbers of *Nitrosomonas* in soils otherwise suited to their growth."

Effect of species of host plant on nitrogen fixation in Melilotus, P. W. WILSON, J. C. BURTON, and V. S. BOND (*Jour. Agr. Res.* [U. S.], *55 (1937), No. 8, pp. 619–629*).—It has been shown at the Wisconsin Experiment Station in experiments with *M. alba, M. officinalis, M. suaveolens,* and *M. dentata* in association with various strains of *Rhizobium meliloti* that "the association of certain of the species of host plants and strains of bacteria were consistently effective. The association of certain strains of bacteria was effective with one species of the host but ineffective with another. The reverse was also observed, i. e., certain species of the host plant were benefited through association with some strains of the organism but not with others. The association of certain species of plant and certain strains of the organism gave rise to erratic responses between experiments as well as within an experiment. There was some evidence that this type of response may have been influenced by the carbohydrate-nitrogen relationship in the plant."

The authors point out that such observations gave some support to the view that "a given strain of the organism is not 'good' or 'poor' in an absolute sense, but only relative to the other factors which affect the relationship. Under certain conditions one factor, as, for example, strain of organism, may determine the effectiveness of the relationship, whereas under other conditions some other factor, such as species of host plant, may be the dominating element."

Humus, fertilizers, and plant nutrition, R. E. STEPHENSON (*Better Crops With Plant Food, 20 (1936), No. 9, pp. 21, 22, 37, 38*).—This contribution from the Oregon Experiment Station is a semipopular discussion of theories concerning the functions of soil humus in plant nutrition.

Fertilization and care of peat soils, R. E. STEPHENSON (*Better Crops With Plant Food, 20 (1936), No. 11, pp. 20–22, 35*).—This brief and more or less popular discussion of the possibilities and needs of peat soils is a contribution from the Oregon Experiment Station.

Comparisons of various nitrogen fertilizers, especially in relation to fall applications versus spring applications, A. L. Schrader (*Peninsula Hort. Soc. [Del.] Trans., 49 (1935), pp. 81–85*).—At the University of Maryland sodium nitrate gave the best response on nitrogen-deficient orchard soils. "Ammonium sulfate . . . has given very good results as a fall fertilizer . . . Calcium nitrate . . . apparently needs more investigation as to responses to be expected. In the Maryland experiments it appeared better as a fall material than as a spring material. Cyanamide, . . . containing approximately 22 percent nitrogen, recently has been produced in a pebble form convenient for orchard use, and probably needs to be applied in the fall as do other slowly available materials. The fall use of cyanamide is especially advisable, since injury to the trees has been quite pronounced in Maryland and in Michigan on both peaches and apples when cyanamide was used after the leaves started to grow. The injury consisted in severe burning of the foliage and in a great percentage of the foliage dropping. If the material is applied in very early spring in relatively small quantities per tree, no such injury will be noted. Potassium nitrate is a very new material for use as a fertilizer but has given good results in New York and Virginia. It may be especially valuable under some conditions where potassium response can be shown, as may be true with some of the lighter sands in Delaware."

Diagnosing the phosphorus needs of soils by biological methods, F. B. Smith, P. E. Brown, and H. C. Millar (*Iowa Acad. Sci. Proc., 42 (1935), pp. 85–87*).—In a series of trials reported from the Iowa State College nine soils of which the field response to phosphate fertilizers had been ascertained under a wide variety of conditions were tested by the *Aspergillus niger*, *Cunninghamella*, bacteriological, and seedling plant methods. For the bacteriological method a mixed culture of *Azotobacter vinelandii* and *Clostridium pasteurianum* was used.

"The data . . . indicate considerable difference in the amount of available phosphorus in the different soils. However, there was no relation between the amount of available phosphorus in any one soil as measured by the various methods. The Lamoure silty clay loam, according to the *A[spergillus] niger* test, contained the largest amount of available phosphorus, and this soil gave the greatest response to phosphate fertilizer in field tests. The Carrington loam and the Tama silt loam contained about the same amount of available phosphorus according to the *Cunninghamella* plaque method, but field tests indicated a deficiency in available phosphorus in the Tama silt loam and no response to phosphate fertilizer in the Carrington loam. The Carrington silt loam contained a relatively large amount of available phosphorus as measured by the mixed culture of bacteria, and this soil did not respond to phosphate fertilizer, but the two methods did not correlate so well in any of the other tests. The Carrington silt loam and the Lamoure silty clay loam contained approximately the same amount of available phosphorus by the seedling plant method, but the one showed no response to phosphate fertilizer in field tests, whereas the other soil gave the largest response of any soil to the phosphate fertilizer."

Fixation of potassium in soils, J. S. Joffe and L. Kolodny (*Science, 84 (1936), No. 2175, p. 232*).—Subjecting to experimental trial the theory that potassium fixation in soils is due to complex silicate formation, the authors of this contribution from the New Jersey Experiment Stations show that artificially prepared silicates of varying silica : basoid ratios formed no insoluble potassium compounds under conditions of temperature and pressure occurring in the soil. Various phosphates, however, did show a fixation reaction.

"Aluminum and iron phosphates were prepared and treated with solutions of KCl corresponding to applications of 7.6 percent of the total dry weight of the respective phosphate complexes. These systems, prepared in triplicates, were then alternately wetted and dried five times at 23°, 35°, and 70° C. The complexes dried at 70° fixed the largest quantities. The iron phosphate fixed 72.15 milliequivalents of K per 100 g, which represents 57.85 percent of the total KCl applied, and aluminum phosphate fixed 71.43 m e., which represents 57.14 percent of the KCl applied. Other cation linkages have been tested under various conditions, and they also were found to fix the K. There is an indication that the NH_4 ion and perhaps other cations may be fixed in the same manner.

"Pedological data on hand seem to fit in with the findings of the laboratory experiments on the fixation of K through the medium of phosphated complexes. There is a definite relation between the phosphated complexes of various cation linkages and the extent of K fixation."

Effect of lime on the availability and the fixation of potash in soils, H. C. Harris (*Soil Sci., 44 (1937), No. 4, pp. 265–275*).—The exchangeable potash and the Neubauer values for potash, as well as the pH, carbon content, and colloids, were determined in soils from the plats of block B on the Delaware Experiment Station Farm. Sassafras silt loam taken from the unlimed parts of the unfertilized plats of block B, Chester loam from northern Delaware, and Norfolk sand from southern Delaware were also treated in various ways in the laboratory, and after treatment the potash removable by the leaching process and by the Neubauer method was determined.

"The lime applied to the plats of block B seems to have had no great effect on potash availability as measured by replaceable potash and Neubauer values. Losses through drainage and unequal removal by the crops could have concealed the effect. Little of the potash applied to block B appears to have accumulated in the soil in a form extractable by the leaching and the Neubauer methods. Grinding the soils in a ball mill increased the exchangeable potash and the Neubauer values. $Ca(OH)_2$ applied to the soils under laboratory conditions had comparatively little effect on the native potash of the soil as measured by the leaching and the Neubauer methods, except that the heavier applications of $Ca(OH)_2$ to Chester loam increased considerably the Neubauer values.

"The unlimed Sassafras silt loam, Chester loam, and Norfolk sand each fixed applied potash. The highest fixation of any of the unlimed soil was about 50 percent on Chester loam as determined by the Neubauer method. In general, increasing the amount of lime increased the fixation, but on this point the leaching method and the Neubauer method are not in agreement either on Chester loam or on Norfolk sand. The Neubauer values for fixation are higher in all cases than those obtained by leaching. The highest fixation of the applied potash as measured by the Neubauer method was about 77 percent with the heaviest application of $Ca(OH)_2$ on Chester loam. Fixation occurred at all pH values (5.33 to 8.46) of the soils studied. Fixation seems to have had no relation to the amount of colloids and organic matter in the soils."

The value of copper sulfate as a soil amendment on some truck crops, with summary of work for 1936 on cotton and tobacco, M. M. Manns, W. L. Churchman, and T. F. Manns (*Peninsula Hort. Soc. [Del.] Trans., 50 (1936), pp. 92–99, figs. 3*).—Continuing earlier work (E. S. R., 75, p. 317), the inclusion of 50 lb. of copper sulfate per ton of fertilizer at the Delaware Experiment Station increased the value of truck crops by from 4.47 percent (sweetpotatoes) to 48.55 percent (lima beans). The average value of tobacco

was increased 33.85 percent, of which 18.4 percent was yield increase and 15.45 percent was quality improvement. Cotton also improved in yield and quality under this treatment.

AGRICULTURAL BOTANY

General and economic botany, E. E. Stanford (*New York and London: D. Appleton-Century Co., 1937, pp. XXIX+675, figs. 436*).—The avowed main objective in presenting this textbook is to "integrate the science of botany with other interests of life to which it should contribute, such as agriculture, horticulture, landscape gardening, agronomy, forestry, zoology, pharmacy, or even medicine." The main subdivisions of the subject matter concern science and the sciences in general; life and living things, including the nature of protoplasm and the phenomena of life and of living matter; biological nomenclature, the species concept, and the main grouping of the plant kingdom; seeds and seedlings; the plant body of the spermatophyte; cells and tissues; the stem; the root; the leaf; the flower, fruit, and seed; the seed plant and its environment; thallophytes—Schizophyta; Flagellata and Phycophyta; Myxophyta, Myxomyceteae, lichens, virus diseases of plants, and plant disease prevention; Embryophyta—Bryophyta and Pteridophyta; Spermatophyta—the Gymnospermae; Angiospermae, including the various groups of dicotyledons and monocotyledons; and evolution, heredity, and plant breeding. A subject index of 23 pages completes the work.

Economic botany: A textbook of useful plants and plant products, A. F. Hill (*New York and London: McGraw-Hill Book Co., 1937, pp. X+592, figs. 255*).—"The present book is the outgrowth of several years' experience in presenting a one-semester course dealing with economic plants. . . . An attempt has been made to include the most important plants of America and other parts of the world insofar as they enter into international commerce. . . . Although intended primarily as a textbook, this work should have an appeal to the ordinary reader, since material of too technical a nature has been avoided as far as possible." The subject matter includes fibers and fiber plants; forest products and resources; tanning and dye materials; rubber and other latex products; gums and resins; essential oils; fatty oils and waxes; sugars, starches, and cellulose products; medicinal plants; fumitories and masticatories; the history and nature of food plants; the major and minor cereals and small grains; legumes and nuts; vegetables; fruits of temperate and tropical regions; spices and other flavoring materials; and beverage plants and beverages. An appendix gives a systematic list of species discussed, and a bibliography of 160 important reference works and an index are provided.

[Research in plant industry] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 81, 82, 83, 88, 89*).—Reports of progress (in many cases in cooperation with State stations) are noted with particular reference to studies of the underlying principles of plant genetics, physiology, and pathology; the breeding and selection of corn resistant to diseases under conditions of high fertility and resistant to dry-land culture; physiologic races of wheat bunt and the development of bunt-resistant varieties; chemical inhibitions of poisoning by selenium, arsenic, rubidium, strontium, and barium; the development of a new high-yielding red oat variety resistant to smut; blister rust on sugar pine in the Pacific States; a new strain of powdery mildew-resistant cantaloup; Dutch elm disease scouting and eradication work; the new virus-induced mosaic of peach; and factors influencing outbreaks of black stem rust of small grains, including barberry eradication.

A rapid quantitative method of studying roots growing under field conditions, R. E. Blaser (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 421–423, figs. 3*).—This contribution by the Florida Experiment Station describes and illustrates improvements on the method originally described by Sprague (E. S. R., 71, p. 616). The advantages claimed lie in the quantitative results; rapidity, making replicated samples possible; use in obtaining material for root reserve analyses; special adaptability to soil types prohibiting deep rooting; value for densely rooted areas, such as pasture sods; and in tracing the seasonal root-growing cycle. Samples of deep-rooting plants are not obtainable by the method.

An improved photoelectric apparatus for measuring leaf areas, P. J. Kramer (*Amer. Jour. Bot., 24 (1937), No. 6, pp. 375, 376, fig. 1*).—Details of construction and operation are given for an apparatus consisting essentially of a plywood box on a light wooden frame, with six 50-w, inside-frosted lamps mounted in a circle near the top of the box as light source and cooled by a 9-in. fan. The interior of the lamp house is painted with aluminum paint and the other interior surfaces black to reduce reflection. The principal new feature is the installation of a cone of polished sheet aluminum between the plate carrying the leaves to be measured and the photoelectric cell, which prevents the light passing through the plate from spreading over the entire chamber. A calibration curve is constructed from the microammeter readings obtained by placing various sized pieces of opaque paper of known areas on the ground-glass plate.

Recent work on photoperiodism, W. W. Garner (*Bot. Rev., 3 (1937), No. 5, pp. 259–275*).—This review, limited chiefly to developments during the last 5 or 6 yr. (with 39 literature references), includes data on photoperiodic classes, varietal differences in photoperiods, tuberization, photoperiodicity in woody plants, photoperiodic aftereffect, vernalization, artificial illumination, spectrum investigations, and vegetative v. reproductive development.

***Biochemical studies of photoperiodism in plants*, A. E. Murneek** (*Missouri Sta. Res. Bul. 268 (1937), pp. 84, figs. 10*).—When Biloxi soybean plants were exposed to a photoperiod conducive to sexual reproduction (7-hr. day) two significant effects on development were noted as follows: Photoperiodic induction of reproduction (first 4–14 days) and photoperiodic inhibition or reduction of growth in height, most conspicuous soon after induction was completed. The two phenomena appeared to be induced independently, but their causal mechanisms have not been found.

During the induction period a relatively higher nitrogen metabolism and lower carbohydrate concentration are maintained by the short-day than by the vegetative (14-hr. day) plants. Stems of reproductive plants were higher in all determined forms of nitrogen, excepting nitrates. In the light of present knowledge of nitrogen and carbohydrate metabolism in sexual reproduction, no specific dynamic function can be ascribed to any particular form or group of substances in initiating floral organs, but present evidence points to a specific flower-producing "hormone," apparently independent of the general nutritional state of the plant.

A higher CO_2 output was maintained at the time of photoperiod induction by the short-day than by the long-day plants, and a similar increase occurred when plants were moved from a long to a short photoperiod. Indoleacetic, indolepropionic, and phenylacetic acids had no effect on initiating sexual reproduction.

Due to photoperiod inhibition, growth in height of short-day soybean plants was retarded after 10-day exposure and ceased by the twentieth day. As a result of curtailed growth, nitrogen and especially carbohydrates accumulated in the stems and other structural parts. The relatively higher concentration of carbohydrates over nitrogen at the time of full bloom and thereafter may

be expressed by a higher C-h/N ratio. These organic groups are utilized by the long-day plants for vegetative growth and by the short-day plants (whose growth is inhibited) for flower formation and fruit and seed development.

The carotene and xanthophyll concentration of soybean leaves under a 7-hr. day reached a maximum at the approximate time of flowering and then decreased. Buds, flowers, and young fruit tissues had a comparatively high carotene content.

The literature list contains 229 references.

Influence of a short photoperiod on the growth and biochemical properties of the Jerusalem artichoke, I. V. Margara (J. Markhara) and V. S. Vovchanets'kiĭ (Vovchanetski) (*Zhur. Inst. Bot. Ukrain. Akad. Nauk (Jour. Inst. Bot. Acad. Sci. Ukraine), 10 (1936), No. 18, pp. 53–64, figs. 4; Eng. abs., p. 64*).—During a short 10-hr. day stunting of the aerial parts was observed and the developmental cycle was completed earlier than with a day of normal length under Kiev conditions. With the 10-hr. day the leaves contained a higher percentage of water and organic matter and a lower percentage of mineral salts than those with the normal day. For the same vegetational period the leaves of plants under the 10-hr. day contained more glucose, sucrose, dextrin, starch, and nitrogen than the control leaves. The absolute yield in tubers under the 10-hr. day was much smaller than that of control plants, but their relative yield (in proportion to mass of aerial parts) was greater. The tubers under the 10-hr. day were rounded and nodulated, while in the controls they were elongated and club-shaped and the percentage of inulin was greater and the water percentage less than in the tubers of control plants.

Plant growth under continuous illumination from sodium vapor lamps supplemented by mercury arc lamps, J. M. Arthur and E. K. Harvill (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 433–443, figs. 4*).—Continuing this series of studies (E. S. R., 74, p. 467), plants which grew well for a short time under continuous exposure to sodium vapor lamps degenerated slowly, only a few yellow leaves at the tip remaining after 2 months' exposure. However, such plants could be completely rejuvenated by 2 hours' exposure daily to the 85-w capillary mercury vapor lamp applied along with continuous sodium vapor lamps. Excellent leaf color and flowering could be induced when plants (e. g., begonia, gardenia, cotton, geranium, buckwheat, and snapdragon) were exposed continuously to sodium vapor lamps supplemented by 2 hours' daily exposure to the capillary mercury lamp. This light proved unsatisfactory for tomato.

A new set of sodium vapor and capillary mercury lamps, operated as above outlined, should burn continuously for about 7 mo. On account of the high efficiency of these light sources the cost for current at 2 ct. per kilowatt is about 50 ct. per 24-hr. day, and one lighting unit will cover effectively at least 16 sq. ft., making an average cost of about 3 ct. per square foot per day.

On the evolution of photosynthesis, H. F. Blum (*Amer. Nat., 71 (1937), No. 735, pp. 350–362*).—The expressed purpose of this paper is to call attention to the uniqueness of the "chlorophyll photosynthetic" process and the magnitude of the problem of its evolution, to distinguish it from other types of photo- and chemosynthesis, and to point out the necessity of a consideration of energetics as a fundamental approach to the study of evolution. The author gives a critical review of the literature of the subject and presents a tentative scheme for the evolution of chlorophyll photosynthesis involving the following steps: Ancient chemosynthetic organisms (type represented by some present-day organisms), primitive photosynthetic forms using one quantum of light energy to activate a spontaneous reaction and a nonspontaneous reaction (the

latter with modern representatives in the green sulfur bacteria), primitive photosynthetic forms requiring two to three quanta (with modern representatives in the purple sulfur bacteria) and four quanta, and the higher green plants using chlorophyll photosynthesis.

Ultraviolet radiation, H. W. Popp (*Pennsylvania Sta. Bul. 352 (1937), p. 40*).—Note on the effect of wavelengths on auxin production in turnip seedlings.

Effect of an applied electric current on the external longitudinal polarity potentials of Douglas fir, H. F. Rosene (*Amer. Jour. Bot., 24 (1937), No. 6, pp. 390–399, figs. 2*).—The longitudinal polarity potentials of the branches and stems were modified by application of a current from an external source. The magnitude of change was directly related to the quantity and duration of flow, and the direction of change was determined by the orientation of the polarity potentials with respect to the direction of flow of the applied current. The magnitude of change produced by a given mean current density for a given time was less when the current was applied to the wood cortex than when applied to the wood axis with the cortex removed. The observed effects were characteristic of living cells only.

"The results furnish direct proof for the validity of the principle of algebraic summation of cell electromotive forces, since changes in electromotive forces are produced in all intermediate microscopic regions along the length of the stem when a current of external origin is applied lengthwise to that stem. Since such applied currents of external origin can change the polarity potentials of living cells, then it may be inferred that similar applied electromotive forces of cell origin may do the same and thus bring about control of electrochemical processes in distant cells and therefore result in cell correlation."

Analytic studies in plant respiration.—VII, Aerobic respiration in barley seedlings and its relation to growth and carbohydrate supply, H. R. Barnell (*Roy. Soc. [London], Proc., Ser. B, 123 (1937), No. 832, pp. 321–342, figs. 10*).—The major features of metabolic activity in young barley seedlings are the hydrolysis of starch in the endosperm, the formation of new tissues in the embryo by growth in dry weight, and the respiration of carbohydrates. The linkage of these functions through translocation was formally set out and their parallel development studied quantitatively in carbohydrate units through the first 162 hr. of germination. The time course of the respiration rate for whole seedlings showed a sigmoid form in its rise to a well-defined upper limiting value set by the amount of carbohydrate being translocated from the endosperm. This limited phase was reached at about hour 90 and was followed to about hour 160, showing only moderate fluctuations around the value of 32 mg CO_2/3 hr./100 seedlings. Sterile dissections of the endosperms were made, and the vitality of the isolated endosperm was demonstrated by its continuous respiration. In the isolated embryos, a rapid fall of respiration set in immediately and the rate declined in geometric progression to a low starvation value of about 1.8 mg CO_2, indicating a very small stock of available reserves in the embryo in the early stage. The survey made required an index of growth rate in terms of dry weight increase. The data obtained showed a considerable scatter, and the precise form of the smooth curve compounded from them was not very well established. Its slopes showed the usual initial course of the acceleration of growth rate up to hour 90, while after that the rate proceeded fairly uniformly. From the numerical dry weight data, a sequence of growth-rate values (G) was calculated throughout the 160-hr. period, so that utilization of carbohydrate in growth might be compared with its consumption in respiration (R_s) over successive periods of development. Seven

of the nine pairs of growth and respiration values obtained in this way showed no drift in the growth/respiration ratio. On their basis the author puts forward, as a first approximation, the mean values that they provide, viz, G/R_e= 1.78, with G and R_e as accounting for, respectively, 64 and 36 percent of the total available carbohydrate supply entering the embryo.

Number of stomata in Phaseolus vulgaris studied with the analysis of variance technique, H. B. Smith (*Amer. Jour. Bot.*, *24* (*1937*), *No. 6*, *pp. 384–387*).—Using this method for establishing a difference between two selections of beans (*Phaseolus vulgaris*), corresponding areas of comparable leaves were selected, and for each leaf used at least 25 unit areas were studied at random in the upper and 50 unit areas in the lower epidermis. It was thus determined that the upper epidermis of the two selections differed significantly in number of stomata per square millimeter of leaf surface, in size of ordinary epidermal cells, and in size of paired guard cells. The two selections differed in the lower epidermis in size of paired guard cells.

Geotropism in plants, F. Rawitscher (*Bot. Rev.*, *3* (*1937*), *No. 4*, *pp. 175–194*).—This review (with 67 literature references) discusses orthogeotropism, analysis of the reaction chain; end reaction; intermediate stages of the reaction chain; tonic and morphotic phenomena; plagiogeotropism and related phenomena; and geotorsions.

Geotropism and the growth substance, H. E. Dolk (*Rec. Trav. Bot. Néerland.*, *33* (*1936*), *No. 2*, *pp. 509–585*, *figs. 26*).—This monographic study concerns the relation between gravity and growth; the influence of gravity on growth-substance distribution; the distribution of geotropic sensitivity in the coleoptile; the course of the curvatures; the influence of gravity, acting longitudinally, on geotropic curvature; and a theoretical discussion of the findings. Oats and corn were used as test plants. A bibliography of over four pages is provided.

Root interactions of plants, W. F. Loehwing (*Bot. Rev.*, *3* (*1937*), *No. 4*, *pp. 195–239*).—In this comprehensive review (with 438 bibliographic references) the author discusses the toxic secretions and the nontoxic excretions of roots, interplanted legumes in relation to other crops, amino acid secretion by legume roots, nodule bacteria and the carbon: nitrogen ratio, interactions of roots with nonsymbiotic bacteria, mycorhizas, and growth-promoting substances. From the data assembled along these lines, it is deemed evident that the more important agronomic problems are concerned with the maintenance of an adequate and continuous nitrogen supply. The value of the numerous technics developed for quantitative studies of plants in situ is also emphasized.

Investigations of the influence of mineral nutrition on anthocyanin formation by barley seedlings [trans. title], G. Gassner and W. Straib (*Angew. Bot.*, *19* (*1937*), *No. 2*, *pp. 225–245*).—This study concerns the effects on anthocyanin production of the nitrogen, phosphoric acid, and potassium nutrition (with the elements in varied amounts and proportions), the significance of soil relations, and the effects of the CO_2 content of the air.

Some aspects of the salt nutrition of higher plants, D. R. Hoagland (*Bot. Rev.*, *3* (*1937*), *No. 6*, *pp. 307–334*).—This review (including 118 literature references) concerns chemical elements essential for growth of the higher green plants, forms of nitrogen in nutrient solutions, general nature of processes of salt absorption by roots, mechanisms of salt accumulation, general aspects of the relations of pH to plant growth, oxygen supply to roots in water cultures, quantitative relations in nutrient solutions, salt absorption in relation to transpiration and to illumination of the shoot, and comments on soil and plant interrelations with reference to artificial culture experiments. "The review is prepared primarily for botanists without a specialized interest in plant

nutrition," and is concerned especially with advances made possible by the use of methods of artificial culture.

Effect of transpiration upon the absorption of mineral salts, R. O. FREELAND (*Amer. Jour. Bot., 24 (1937), No. 6, pp. 373, 374*).—In this study by Ohio State University, the effect of transpiration on the absorption of minerals was measured by the use of water cultures and a short growth period to eliminate marked differences in growth and syntheses within the plants (corn and *Phaseolus vulgaris*), transpiration rates being controlled by varying the humidity. An increase in water absorption resulted in an increase in mineral absorption. Different mineral ions were not absorbed at the same rate, and the absorption rate of each ion varied with the kind of plant used.

The influence of lead compounds on the growth of barley, C. M. KEATON (*Soil Sci., 43 (1937), No. 6, pp. 401–411, pls. 2, figs. 1*).—The results of this study by the Washington Experiment Station indicated that because of the high fixing power of the soils used large amounts of lead could be added without harmful effects. Lead carbonate at the rate of 7,190 lb. per acre caused no observable injury to the growth of barley, and the tendency was for growth to be stimulated by minute amounts of soluble lead in the soil. There appeared to be a relationship between growth stimulation and the soluble lead content of the soil, with a tendency for maximum stimulation at 0.1–0.4 p. p. m. of PbO. Lead was found in both the tops and roots, the concentration being notably higher in the latter. The plants tended to absorb greater quantities of lead with increasing concentrations of soluble lead in the soil.

Thiazole and the growth of excised tomato roots, W. J. ROBBINS and M. A. BARTLEY (*Natl. Acad. Sci. Proc., 23 (1937), No. 7, pp. 385–388*).—In earlier work it was found that a medium containing mineral salts, pure cane sugar, and crystalline vitamin B_1 was adequate for apparently indefinite growth of excised tomato roots (E. S. R., 76, p. 769). In the experiment reported here it was found that vitamin B_1 could not be replaced in such a solution, under the conditions of the test, by vitamin G or B_2 (lactoflavine), cysteine hydrochloride, pantothenic acid, indole-3-acetic acid, inositol, urea, asparagine, yeast ash, zinc and boron salts, or the Hoagland A to Z mixture containing salts of lithium, copper, zinc, boron, aluminum, tin, manganese, nickel, cobalt, titanium, iodine, and bromine. However, 4-methyl-5-β-hydroxyethylthiazole, one constituent used in synthesizing vitamin B_1, was able at a concentration of 0.1γ per cubic centimeter to replace vitamin B_1, although 2-methyl-5-bromo-methyl-6-aminopyrimidine, the other constituent in synthesizing vitamin B_1, was unable to do so. This indicates that the thiazole but not the pyrimidine radical of the vitamin is effective.

The metabolism of amides in green plants.—I, The amides of the tobacco leaf, H. B. VICKERY, G. W. PUCHER, A. J. WAKEMAN, and C. S. LEAVENWORTH (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 369–382*).—In these studies by the Connecticut [New Haven] Experiment Station, when tobacco leaves were cultured in water or dilute nutrient solutions in the dark a prompt and extensive asparagine enrichment occurred, with simultaneous glutamine enrichment very small. When exposed to continuous light both substances were synthesized, but glutamine to a somewhat greater extent. Appreciable amounts of ammonia accumulated in dark cultures, but the amount developed in the light was insignificant even after 235 hr. All the nitrogen involved in amide synthesis and in free-ammonia production was accounted for by assuming that the amino acids resulting from digestion of the protein suffered deamination with ammonia production, and that the diminution in nitrate which also occurred likewise gave rise to ammonia. To account for the amide synthesis, it was further assumed that a nonnitrogenous precursor in normal leaves occurs in sufficient amounts for the

production of a considerable quantity of asparagine and that a nonnitrogenous precursor of glutamine is also synthesized in even greater relative proportion in leaves exposed to light. The nature of these precursors is unknown, but the one required for glutamine synthesis is produced by photosynthesis and is, accordingly, a carbohydrate or a carbohydrate metabolite. Glutamine then, and also probably asparagine, forms important links between the general carbohydrate and protein metabolism.

The behavior of these two substances in tobacco is interpretable in terms of the theory that amides are synthesized in plants in response to an increase in ammonia, and that they provide a mechanism whereby the ammonia concentration is usually maintained below the toxic level. The tobacco plant is an example of a species in which, under certain conditions, both these amides are thus employed.

The carbon metabolism of Gibberella saubinetii on glucose, L. E. HESSLER and R. A. GORTNER (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 193–200*).—This study by the Minnesota Experiment Station was made on a glucose-artificial salt medium. Ethyl alcohol was identified as the almost exclusive constituent of the volatile neutral compounds fraction, though qualitative tests indicated traces of an aldehyde. Tartaric and citric acids were identified in the nonvolatile acid fraction, and acetic acid was the only acid found in the volatile acid fraction. The principal metabolic products of *G. saubinetii* proved to be CO_2 and ethyl alcohol, indicating that the fungus causes a rather typical alcoholic fermentation. In this respect it resembles other Fusaria which have been studied.

Recent advances in physiology of reproduction of plants, A. E. MURNEEK (*Science, 86 (1937), No. 2220, pp. 43–47*).—This is a review contributed from the Missouri Experiment Station.

Plasmolytic method of determining the germinating capacity of seeds, A. V. DOROSHENKO (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 4 ser., No. 2 (1937), pp. 113–119, figs. 2; Eng. abs., p. 119*).—The author reports the successful use, with large seeds such as those of legumes and fruit trees, of plasmolytic treatment with KNO_3, and/or sugar solutions to determine the germinating capacity much more quickly than by germination methods.

Wave lengths of radiation in the visible spectrum promoting the germination of light-sensitive lettuce seed, L. H. FLINT and E. D. MCALISTER (*Smithsn. Misc. Collect., 96 (1937), No. 2, pp. 8, pl. 1, figs. 2*).—Irradiation by wavelengths of about 5,200–7,000 a. u. promoted the germination of light-sensitive lettuce seed, but within this range the longer wavelengths proved by far the most effective. The critical wavelength promoting germination within the most effective range was approximately 6,700 a. u. Within the limits of experimental error the radiation most effective in promoting germination was that most abundantly absorbed by chlorophyll in the same region, and the absorption characteristics of an acetone extract demonstrated the presence of chlorophyll in the seed.

The effect of ascorbic acid and certain indole derivatives on the regeneration and germination of plants, W. DAVIES, G. A. ATKINS, and P. C. B. HUDSON (*Ann. Bot. [London], n. ser., 1 (1937), No. 2, pp. 329–351, pls. 3*).—The authors describe new methods of preparing indole derivatives insuring against contamination with heteroauxin and the results of tests with these substances relative to epinastic responses in tomato and *Ricinus*, to regeneration of buds and roots in willow branches, and to germination of seeds.

Pigmentation in plants, exclusive of the algae, M. MÖBIUS (*Bot. Rev., 3 (1937), No. 7, pp. 351–363*).—This is a review of published data on the means

"by which nature produces her great variety of colors in the plant kingdom." The discussion is concerned less with the individual pigments and their carriers than with the methods employed by plants in producing their color impressions, and the subject matter is presented under the headings green, yellow, orange, brown, red, blue, violet, black, gray, white, and glossiness.

Observations on the structure of cotton fibers in the dark field, B. Rabinowitsch (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 401–403, fig. 1*).—Using *Gossypium hirsutum* with fibers at 7–55 days after blossoming, the cellulose particles occurred predominantly as uncombined units in the young fibers, but with increasing age chains of particles were formed. Microscopic mounts of chemically treated commercial fibers showed the reverse process of wall formation, with all stages of membrane layers disintegrating into fibrils, and these, in turn, into cellulose particles.

Identification of crystalline cellulose in young cotton fibers by X-ray diffraction analysis, W. A. Sisson (*Contrib. Boyce Thompson Inst., 8 (1937), No. 5, pp. 389–400, figs. 3*).—Cotton fibers 5–50 days old were subjected to X-ray diffraction analysis, samples consisting of fresh and preserved untreated fibers, fibers after chloroform extraction, and those after further purification with 1 percent NaOH and 2 percent sodium hypochloride. Crystalline cellulose was indicated at about 30–35 days in the untreated fibers, at 15–20 days in the extracted, and as early as 5 days in the purified fibers. The cellulose pattern was not present in the X-ray diagram of the first group, being masked by a crystalline "wax pattern" (removable by extraction with organic solvents) and by an amorphous diagram (removable by dilute alkalies and bleaching). The crystallographic identity of the cellulose from the young purified fibers to that of mature cellulose is shown by its identical unit cell dimensions and by the fact that the native X-ray pattern may be changed to a mercerized pattern. The observations of Farr and Eckerson (E. S. R., 71, p. 170) are confirmed, in that cellulose is first formed in the cytoplasm as crystalline cellulose particles. After cellulose is once formed it does not undergo a crystalline modification during fiber growth.

The Amaryllidaceae of Texas, V. L. Cory (*Herbertia, 3 (1936), pp. 78, 79*).—In this contribution by the Texas Experiment Station, 25 species are listed, with their distribution zones.

Phymatotrichum silvicolum n. sp.: Its structure and development, J. J. Taubenhaus and G. M. Watkins (*Amer. Jour. Bot., 24 (1937), No. 6, pp. 387–390, figs. 22*).—The new species of fungus studied in this contribution by the Texas Experiment Station is described as producing spore mats on the surface of sandy loam soil in wooded areas in various parts of east central, south central, and east Texas, and an account of the structure and development of vegetative hyphae, conidiophores, and conidia is given.

The embryo sac of Eragrostis cilianensis (All.) Link: A new type embryo sac and a summary of grass embryo sac investigations, E. L. Stover (*Ohio Jour. Sci., 37 (1937), No. 3, pp. 172–184, figs. 19*).—This morphological and developmental study includes the spikelets and ovules, archesporial cell and megaspores, embryo sac, seed coat development, endosperm, and embryo of *E. cilianensis*. Tabulated data (since 1849) are given on the antipodals, embryo sacs, etc., of various other grass species listed, and a bibliography of 52 titles is included.

GENETICS

Genetics and the origin of species, T. Dobzhansky (*New York: Columbia Univ. Press, 1937, pp. XVI+364, figs. 22*).—This book deals largely with a critical evaluation of theories of evolution and the advances which have been

made toward the origin of species by the more recent advances in genetic knowledge.

Statistical methods in biology, medicine, and psychology, C. B. Davenport and M. P. Ekas (*New York: John Wiley & Sons; London: Chapman & Hall, 1936, 4. ed., rev., pp. XII+216, figs. 26*).—A revision of a book first published in 1899, bringing it up to date and taking account of the new developments in the analysis of variance and the theories of small sampling.

An outline of cytological technique for plant breeders (*Cambridge, Eng.: Imp. Bur. Plant Genet., 1937, pp. 14*).—Procedure considered useful for practical plant breeders has been prepared by J. L. Fyfe.

The experimental production of haploids and polyploids (*Cambridge, Eng.: Imp. Bur..Plant Genet., 1936, pp. 28*).—The review covers 281 titles.

Somatic segregation and its relation to atypical growth, D. F. Jones (*Genetics, 22 (1937), No. 5, pp. 484–522, pl. 1, figs. 20*).—Genetic studies with corn by the Connecticut [New Haven] Experiment Station and the California Institute of Technology are reported. Previous hypotheses attempting to account for genetic changes during development are reviewed, and it is shown that incomplete fertilization, mutation, nondisjunction, and deletion cannot account for all observed facts.

Paired changes, visible in adjacent areas and noted previously in pome and citrus fruits and in corn pericarp, were found to be frequent in corn aleurone and endosperm, showing the result of a shift of known color and texture genes. More than one dominant allele evidently may be lost or shifted from homologous chromosomes at the same time. The aleurone color gene *C* is lost or shifted with a higher frequency when in a chromosome with a translocated piece attached at the opposite arm than in normal plants. Linked genes *C* and *Wx*, are lost or shifted together or separately.

Seeds treated with X-rays shortly after fertilization show marked increase of interchromosomal mosaics in adjacent areas. The dark part of a paired aleurone color mosaic may revert to normal, to colorless, or become still darker. Some secondary changes are paired alterations. Linked genes may shift together or separately in these secondary changes.

Tissues losing one or more genes are highly unstable and may show frequent losses of other genes in subsequent cell generations. Chromosome stability, as measured by frequency of mosaics, varies widely in different families and from one generation to the next in the same family.

Reciprocal gene exchanges occur between nonhomologous chromosomes. Evidently there is also an interchange between homologous chromosomes during development. Changes in cell size and arrangement occur alone or may accompany changes in color and texture, and result in depressions and outgrowths which are sometimes paired.

"Atypical growth is considered to be the result of the removal from, or concentration in, certain cells of essential growth-regulating substances brought about by unequal mitosis, with or without visible alteration of the chromosomes. This unequal mitosis may be induced by external agencies or by inherited defects of the mechanism of cell division transmitted in part through the female parent."

Chromosome homology in races of maize from different geographical regions, D. C. Cooper and R. A. Brink (*Amer. Nat., 71 (1937), No. 737, pp. 582–587, figs. 6*).—Cytological studies were made at the Wisconsin Experiment Station on hybrids among corn varieties native to Wisconsin and from Canada and Central and South America. "The regularity of chromosome behavior and the close agreement in size of the members of the pairs in the hybrids between

our native corns and races from different geographic regions indicate little if any difference in chromosome structure in the genus, even though some lines may have been grown in isolated regions for many years, perhaps centuries."

Contributions of genetics to understanding of animal disease, J. W. Gowen (*Jour. Heredity, 28 (1937), No. 7, pp. 233–240, figs. 5*).—A discussion of differences in the response of strains of animals to variations in pathogenes, including lethal factors.

A genetic history of Hereford cattle in the United States, O. S. Willham (*Jour. Heredity, 28 (1937), No. 8, pp. 283–294, figs. 4*).—Continuing the statistical studies of the genetic history of breeds of livestock from the Iowa Experiment Station (E. S. R., 78, p. 31), analyses were made by sampling methods of the inbreeding and relationship of calves born at 10-yr. periods from 1870 to 1930. The average interval between generations was 5.4 yr. There was an increase in the inbreeding coefficient to 8.1 percent. A tendency toward the formation of families was indicated when the inbreeding coefficient for the stock was considered in connection with the inter se relationship of only 8.8 percent. High degrees of relationship were found within the breed to Anxiety 4th and his descendants, especially his grandson, Beau Brummel. Special show groups in 1920 and 1930 had higher inbreeding and inter se relationships, both reaching 17 percent in the 1930 group.

Genetic history of Holstein-Friesian cattle in the United States, J. L. Lush, J. C. Holbert, and O. S. Willham (*Holstein-Friesian World, 34 (1937), No. 16, pp. 763, 764, 774, fig. 1*).—Previously noted in greater detail (E. S. R., 75, p. 324).

Inherited hairlessness in the goat: With some observations on parallel mutation, D. Kislovsky (*Jour. Heredity, 28 (1937), No. 8, pp. 265–267, pl. 1, fig. 1*).—A goat, hairless at birth, backcrossed to his dam produced one normal and one hairless kid at the Institute of Animal Breeding at the Timiriaseff Academy, Moskva (Moscow), U. S. S. R. The condition was therefore suggested as recessive. A discussion is given of the occurrence of hairlessness in other species.

Inbreeding and relationship in the Danish Landrace of swine, K. Rottensten (*Nord. Jordbrugsforsk., 1937, No. 3–4 A, pp. 94–114, figs. 3; Fr. abs., pp. 112, 113; Eng. abs., pp. 113, 114*).—An analysis by sample pedigrees as used by Lush (E. S. R., 75, p. 324) of the breeding methods followed in the Danish swine breeding system with Landrace hogs (E. S. R., 76, p. 176) showed that the inbreeding coefficient rose to 6.9±0.7 percent in 14.9 generations from 1897 to 1930. There was a tendency to avoid even mild inbreeding in the careful selection of unrelated sires for use in each center. No single animal exerted any dominant influence on the breed.

The hereditary and environmental portions of the variance in weaning weights of Poland-China pigs, J. H. Bywaters (*Genetics, 22 (1937), No. 5, pp. 457–468, figs. 2*).—In an analysis of the variance in the 60-day weaning weights of 1,633 Poland-China pigs born in 271 litters in an inbreeding experiment at the Iowa Experiment Station, correlations were calculated between the weights of litter mates and those of parents and offspring, and taking account of age of dam and seasonal effects. From these data it was estimated that 18 percent of the variance was due to heredity, 40 percent to environment common to litter mates, and 42 percent due to environment not common to litter mates. Sex and size of litter had only minor effects on variance in weaning weight.

Segregation of mutant characters of deer mice, H. W. Feldman (*Amer. Nat., 71 (1937), No. 735, pp. 426–429*).—Linkages in the deer mouse of the genes

for albinism, piebald, pallid, hairless, and yellow were tested with negative results. The similarity between these characters in *Peromyscus maniculatus* and the mouse and rat was discussed.

Hereditary pathological investigation on rabbits [trans. title], H. Nachtsheim (*Ztschr. Induktive Abstam. u. Vererbungslehre, 73 (1937), No. 3–4, pp. 463–466*).—Hereditary anomalies of the nervous system, eyes, hide, hair, teeth, skull, and conformation observed in work with from 1,200 to 1,500 rabbits are described.

A pale mutation in the ground squirrel: An albinoid color-phase in Citellus elegans resembling the recessive cream mutation in the rat, F. H. Clark and W. L. Jellison (*Jour. Heredity, 28 (1937), No. 7, pp. 259, 260, fig. 1*).—A description of a pinkish buff or cinnamon buff mutation observed in the coat color of wild ground squirrels.

Inheritance of egg size and egg character, F. A. Hays (*Massachusetts Sta. Bul. 344 (1937), pp. 28, pls. 3, figs. 3*).—Three lines of Rhode Island Reds, selected for small, medium, and large egg size, were carried through nine generations. Study was made of the seasonal correlations between egg weights, which were found to be relatively high. The mean egg weights for the small line differed significantly from the mean egg weights for all the daughters produced in the medium line, but differences between the medium and large egg size line were insignificant. The largest eggs were produced in March for all lines. In general, the results indicated no advantages in selecting for hatching purposes pullet eggs that weighed more than 26 oz. per dozen. Attainment of standard egg weight within 60 days was indicative of the production of large eggs. It was concluded that the inheritance of egg size depends upon three dominant genes, A, B, and C. Gene A alone gives small egg size and is at least partially epistatic to B and C, either of which alone produces eggs of medium weight. Combinations of genes C and B give large egg size, but all three produce eggs of medium weight. A study of the inheritance of external egg characters showed that the following were not hereditary: Ridged shell condition, egg shape, and shell flecking. The sandy shell character of the egg depends on recessive genes, and a single recessive gene for high shell porosity was also indicated. Shell pigmentation was classified on the basis of eight shades from white to vinaceous cinnamon, controlled in inheritance by multiple factors. The most desirable color was light pinkish or vinaceous cinnamon. Dams laying eggs of this color produced few daughters laying light colored eggs.

Investigations on the sensitivity of hair pigmentation in Russian rabbits [trans. title], R. Danneel (*Ztschr. Induktive Abstam. u. Vererbungslehre, 73 (1937), No. 3–4, pp. 456–462, figs. 6*).—Results similar to those cited by Danneel and Lubnow (E. S. R., 77, p. 319) led to the conclusion that irradiation rendered the mitochondria of the hair-building cells nonfunctional and prevented pigment formation in the black Alaska rabbit similar to that caused by lowering the temperature below 33° C. during early formation of the hair.

Sexual dimorphism in North American hawks.—I, Sex organs, A. J. Stanley (*Jour. Morph., 61 (1937), No. 2, pp. 321–349, pls. 5, figs. 2*).—Study of the development of the ovaries and oviducts in several species of hawks, from embryos to adults, showed much variation in the persistence of the right ovary and oviducts. In four species both ovaries were equal in size, in three species the right ovary was more than one-third as large as the left, and in eight species the right ovary was less than one-third the size of the left.

Correlation between ocular stimulation and spermatogenesis in the English sparrow (Passer domesticus), A. R. Ringoen and A. Kirschbaum (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 111–113*).—Seven hours' additional light daily were more effective in stimulating the formation of

spermatozoa when the birds' heads were not covered to exclude light than when hoods were used during the lighting period, suggesting that the light stimulus to spermatogenesis was received through the ocular region.

Reproductive organs of two mammalian hermaphrodites and their response to injections of pregnant mare serum, L. J. WELLS (*Anat. Rec.*, *67 (1937), No. 2, pp. 233–251, figs. 30*).—The reproductive organs of two hermaphroditic ground squirrels are described. Injections of one with pregnant mare serum induced the formation of spermatozoa, Graafian follicles, and corpora lutea and stimulated all accessory reproductive organs.

The chemistry of the lactogenic hormone extracts, W. H. MCSHAN and H. E. FRENCH (*Jour. Biol. Chem.*, *117 (1937), No. 1, pp. 111–117*).—Chemical analyses at the Missouri Experiment Station of acetic acid and acid acetone extracts of the lactogenic hormone showed it to be largely protein in nature.

Testis hormone in relation to age, C. W. HOOKER (*Endocrinology*, *21 (1937), No. 5, pp. 655–658, figs. 2*).—Assays of extracts of testes and urine from 27 bulls, ranging in age from 1 mo. to 15 yr., showed that the male hormone content of the testes increased slowly but progressively to about 2 yr. of age, followed by a rapid increase to 5 yr. and subsequently a decrease. Since puberty is attended by no sharp change in the rate of hormone production by the testes, the hypothesis is advanced that at this age the tissues acquire a capacity to respond to a quantity of hormone previously ineffective.

Some effects of synthetically prepared male hormone (androsterone) in the rat, C. R. MOORE and D. PRICE (*Endocrinology*, *21 (1937), No. 3, pp. 313–329, figs. 8*).—By the daily subcutaneous administration of synthetic androsterone to castrated rats it was possible to maintain the normal secretory activity of the prostate glands and seminal vesicles or restore them after castration damages had occurred. The prostate seminal-vesicle ratio could be normally maintained in castrate animals by synthetic androsterone. In normal animals, testicular damage from androsterone administration was thought to be due to the injurious effects of this hormone on the pituitary.

Effects of androsterone and testosterone on oestrous cycle of rats, L. G. BROWMAN (*Soc. Expt. Biol. and Med. Proc.*, *36 (1937), No. 2, pp. 205–208*).—Daily injections of from 0.5 to 3 mg of testosterone and from 3 to 5 mg of androsterone in oil suppressed oestrus in normal female rats. Action on the pituitary gland seemed to explain the results, although there was nothing to rule out a direct effect on the ovary.

Comparative action of testosterone compounds, of estrone and of combinations of testosterone compounds and estrone on the anterior hypophysis, J. M. WOLFE and J. B. HAMILTON (*Endocrinology*, *21 (1937), No. 5, pp. 603–610*).—Injections of oestrone into normal and castrated female and normal mature male rats caused marked weight increases in the pituitaries, complete degranulation of the basophiles, and other changes, all of which were suppressed when the male hormone was administered simultaneously with the oestrone. Pituitary response to oestrone injections in immature rats was limited to degranulation of the basophile cells.

The retrogression of the lactating mammary gland in the guinea pig, C. HESSELBERG and L. LOEB (*Amer. Jour. Physiol.*, *118 (1937), No. 3, pp. 528–531*).—In a series of experiments involving 25 lactating guinea pigs, ligation of one nipple was followed by retrogression of that gland even though suckling was permitted on the normal side and milk secretion continued there. It therefore appears that milk secretion and retrogression of the mammary gland in the guinea pig is controlled by a local mechanism, in contrast to that observed in the rat.

The histology of the mammary glands of adrenalectomized lactating rats, I. LEVENSTEIN (*Anat. Rec., 67* (*1937*), *No. 4, pp. 477–491, pls. 2*).—Histological study of the mammary glands of lactating adrenalectomized rats showed only slight changes from the normal, and milk secretion did not completely stop if the suckling stimulus was continued, although the consistency of the milk was thicker. Treatment with saline solution largely remedied the lactation deficiency, supporting the hypothesis that deficient fluids were the real cause of the difficulty.

Studies on the physiology of lactation.—VII, Lactation in thyroidectomized rats and guinea pigs, W. O. NELSON and C. E. TOBIN (*Endocrinology, 21* (*1937*), *No. 5, pp. 670–676*).—Continuing this series (E. S. R., 78, p. 32), studies with female rats thyroidectomized during gestation or prior to mating showed that parturition, lactation, and suckling of young were successful in the absence of the thyroid. Lactation responses to hypophysectomy and cortical, lactogenic, and oestrogenic hormone administration were similar in animals with or without thyroid. Thyroidectomy caused prolongation of the dioestrous period, increased the number of infertile matings, and caused a tendency toward the production of smaller litters.

Action of testosterone on lactation, J. M. ROBSON (*Soc. Expt. Biol. and Med. Proc., 36* (*1937*), *No. 2, p. 153*).—Since oestrone and the gonadotropic hormone from pregnancy urine have been found to inhibit lactation, tests were made of the effect of preparations of male hormone on lactation. Testosterone propionate inhibited lactation, whereas androsterone had no such effect.

Emphasis of the growth effect of prolactin on the crop gland of the pigeon by arrest of mitoses with colchicine, C. P. LEBLOND and E. ALLEN (*Endocrinology, 21* (*1937*), *No. 4, pp. 455–460, figs. 3*).—In the epithelium of the crop glands of pigeons following the administration of prolactin about 1 percent of the cells were in mitosis, but when colchicine was administered the percentage of cells in active mitosis was increased to 26.

A short test for ovarian follicular hormone and other estrogens, E. ALLEN, G. M. SMITH, and W. U. GARDNER (*Endocrinology, 21* (*1937*), *No. 3, pp. 412, 413*).—Description is given of a short test for assaying oestrogenic hormones which may be completed in from 10 to 16 hr. by the injection of colchicine with the oestrogenic material referred to above.

The growth, maturation, and atresia of ovarian eggs in the rabbit, G. PINCUS and E. V. ENZMANN (*Jour. Morph., 61* (*1937*), *No. 2, pp. 351–383, pls. 3, figs. 6*).—Continuing previous studies (E. S. R., 76, p. 320), the growth movement and atresia of follicles in the ovaries from rabbits in different stages of the sexual cycle are described. There was no indication of ovogenesis during sexual maturity. Development of the ovum was divided into nine stages, and atresia of the follicles into four stages. Measurements are presented of the different types and the distribution and numbers of normal and atretic follicles in the ovaries of does pregnant 22 days, in heat, and after mating, ovulation, and injection of gonadotropic hormones and thyroxin. Maturation of ova is normally completed in from 7 to 8 hr. after copulation. There was little atresia in young oocytes (about 10 percent), but about 60 percent of the large follicles were atretic.

The fate of mouse ova tube-locked by injections of oestrogenic substances, H. O. BURDICK, R. WHITNEY, and G. PINCUS (*Anat. Rec., 67* (*1937*), *No. 4, pp. 513–519, pl. 1*).—Tube-locked ova in female mice were found to undergo early cleavage, but by the end of the blastocyst stage degeneration sets in, presumably due to the greater density of the tubal fluids.

Comparative action of gonad-stimulating hormones on the ovaries of rats, H. L. Fevold, F. L. Hisaw, and R. O. Greep (*Endocrinology, 21 (1937), No. 3, pp. 343–345, figs. 2*).—Data are presented to show that although the luteinizing hormone has no influence on ovarian weight in immature rats, the administration of the follicle-stimulating hormone to immature, normal, and hypophysectomized females increased the ovaries until a weight of from 50 to 70 mg was reached, with an approximate limitation at that point. When both hormones were administered together, the response increased with the dosage. Tannic acid and copper salts did not limit the nature of the response.

Complete and incomplete estrogenic hormones, arising from different sites in the rat's ovary, S. C. Freed and S. Soskin (*Endocrinology, 21 (1937), No. 5, pp. 599–602*).—The administration of 25 rat units of anterior-pituitary-like hormone to female rats varying from 6 to 21 days of age was found to have different effects on endometrial proliferation. Complete oestrus occurred only after the ovarian granulosa had responded to the treatment. These results are offered as evidence that two oestrogenic hormones are secreted by the ovary. One by the theca is incomplete, whereas the follicular oestrin is relatively complete.

Acceleration of the rate of passage of fertilized ova through the fallopian tubes of mice by massive injections of an estrogenic substance, H. O. Burdick and R. Whitney (*Endocrinology, 21 (1937), No. 5, pp. 637–643*).—The time after copulation normally required for mouse ova to reach the uterus of from 72 to 96 hr. was reduced to from 30 to 40 hr. by the administration of massive doses of oestrogenic hormone (100 to 500 rat units of Progynon-B). Massive injections of the oestrogen also resulted in rapid development of the corpora lutea.

Hypophyseal gonadotropic hormones and the luteinization phenomenon in the rat, C. A. Pfeiffer (*Anat. Rec., 67 (1937), No. 2, pp. 159–175, figs. 4*).—From a study of the reaction to copper sulfate of the ovaries in females to which masculinized hypophyses were administered, and of ovaries grafted into males, it is concluded that the physiological reaction of the ovary under the influence of male or female rat hypophysis cannot be explained by the action of a single gonadotropic hormone. One hormone is suggested for follicular development and another for ovulation and luteinization. Reference is also made to the action of an interstitial cell-stimulating hormone, the third gonadotropic hormone of the anterior pituitary (E. S. R., 75, p. 327).

The quantitative assay of "follicle stimulating" substances, L. Levin and H. H. Tyndale (*Endocrinology, 21 (1937), No. 5, pp. 619–628, figs. 4*).—Observation on 563 immature mice showed that change in the weight of the uterus was much more sensitive than changes in the weight of the ovaries as a quantitative indicator for assay of the follicle-stimulating hormone.

Changes in the relative amounts of the follicle stimulating and luteinizing hormones in the hypophysis of the female rat under varying experimental conditions, S. L. Leonard (*Endocrinology, 21 (1937) No. 3, pp. 330–334*).—By taking advantage of the reciprocal relationship between the gonads and the hypophysis in the augmentation test, determination was made of the follicle-stimulating and luteinizing hormones in hypophyseal tissue from adult females before and after gonadectomy and with and without oestrin treatment. Castration greatly increased the production of the follicle-stimulating hormone, but only slightly increased the luteinizing hormone. The amounts of both hormones were reduced by oestrin treatment of the ovariectomized female. Oestrin treatment of immature rats decreased the response to the follicle-stimulating hormone, but not to the luteinizing hormone.

The spermatogenic and secretory function of the gonads of hypophysectomized adult rats treated with pituitary FSH and LH, R. O. Greep and H. L. Fevold (*Endocrinology, 21 (1937), No. 5, pp. 611–618, figs. 10*).—The administration of follicle-stimulating hormone to hypophysectomized rats prevented cessation of spermatogenesis, although regression of the secondary sexual structures occurred. Post-operative and atrophied tubules were restored to full spermatogenesis by the treatment. Injections of the luteinizing hormone sustained both the gametogenic and endocrine activities of the adult testes of hypophysectomized animals.

FIELD CROPS

[Crops research of the U. S. Department of Agriculture, 1937] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 82, 83, 84*).—Brief reports are made on the merits of certain early drought-resistant grain sorghums as Kalo and Early Kalo, adapted to the northwestern portion of the grain sorghum region, and Club, a new variety selected from kafir and outyielding other varieties in Kansas, all developed in cooperation with the Kansas Experiment Station, and Sooner milo, valuable in the dust bowl region; significant observations in a regional cotton variety study; the profitable growing of disease-resistant sugarcane varieties developed at Canal Point, Fla., by the Bureau of Plant Industry and released for commercial culture in cooperation with the Louisiana Experiment Station; and the successful use of curly top-resistant sugar beet varieties in producing areas of western United States.

[Field crops work in Pennsylvania], J. W. White, H. B. Musser, F. D. Gardner, S. I. Bechdel, O. Olson, D. E. Haley, C. F. Noll, C. J. Irvin, E. L. Nixon, and J. J. Reid (*Pennsylvania Sta. Bul. 352 (1937), pp. 29–32, 33, 39, 40, 43, fig. 1*).—Brief reports are made on agronomic research, several phases of which were in cooperation with the U. S. Department of Agriculture, including breeding work with potatoes, oats, soybeans, tobacco, grasses, and red clover; inheritance studies with oats; variety trials with wheat, oats, barley, soybeans, tobacco, and alfalfa; variety-planting tests with potatoes; rotations for tobacco; fertilizer experiments with tobacco, pastures, and turf grasses; and studies of soil acidity tolerance of strains of red clover and *Rhizobium trifolii*.

[Field crops experiments in Puerto Rico in 1936] (*Puerto Rico Sta. Rpt. 1936, pp. 40–42, 43, 44, 48, 61–67, 90, 91, 93, fig. 1*).—Agronomic work reported on briefly dealt with the soil adaptations, variability in number, weight, and shape of tubers, and relation between size of tuber and extent of harvest and handling injury, all with yams; breeding work, variability in flowering and fruiting, and varietal sterility with sweetpotatoes; variety tests with soybeans; comparative trials of sugarcane varieties; and a study of the distribution of sugarcane roots in the soil.

[Forage crops investigations in Wales] (*Welsh Jour. Agr., 13 (1937), pp. 129–223, 246–259, pl. 1, figs. 4*).—Additional research (E. S. R., 76, p. 178) with forage crops, meadows, and pastures, and other agronomic studies conducted in Wales are reported in articles entitled The Preservation of Green Fodder, by T. W. Fagan and W. M. Ashton (pp. 129–144); The Chemical Composition of the Straw of Strong and Weak-Strawed Varieties of Oats, by W. M. Ashton (pp. 144–151); The Development of Certain Grasses and Clovers During the Seeding Year, by W. Davies and J. H. Western (pp. 152–160); Field Trials With Pedigree and Indigenous Strains of Grasses, by M. T. Thomas (pp. 160–172); Heterosis in Red Clover—Effect of In-Breeding in F_2 and F_3 Populations, by R. D. Williams (pp. 172–190); The Shape of the Shoot-Bud Prophyll in the Rye-Grasses and Broad-Leaved Fescues as a Diagnostic Character for Their

Separation in the Field, by A. R. Beddows (pp. 190–195); Seed Production of a Pasture-Type of Rye-Grass, by G. Evans (pp. 195–211); The Cahn Hill Improvement Scheme, by M. Griffith (pp. 211–223); The Growing Danger of Lime Depletion in Welsh Soils, by R. Williams (pp. 246–255); and Reclamation of Upland Peat in Glamorgan, by D. Davidson and E. Withers (pp. 256–259).

[Utilization of farm crops] (In *Condensed Proceedings of the Midwestern Conference on Agriculture, Industry, and Science, Omaha, Nebr., March 9–10, 1937. Dearborn, Mich.: Farm Chemurgic Council, 1937, pp. 10–22, 37–39, 44–50, 75–102, figs. 2*).—Contributions of experiment station and U. S. Department of Agriculture workers include Industrial Utilization of Farm Products, by H. G. Knight (pp. 10–16), and U. S. Regional Soy Bean Industrial Products Laboratory, by O. E. May (pp. 75–80) (both U. S. D. A.); New Crops for the Great Plains Region, by L. E. Call (pp. 17–22) (Kans.); Iowa Corn Research Institute, by R. M. Hixon (pp. 37–39), and Farm Products in the Fermentation Industry, by E. I. Fulmer (pp. 44–50) (both Iowa); Artichokes as a Farm Crop, by T. A. Kiesselbach (pp. 81–89), and Economics of the Industrial Uses of Farm Crops, by H. C. Filley (pp. 97–102) (both Nebr.); and The Production and Processing of Flax, by H. L. Walster (pp. 90–96) (N. Dak.).

Experiments with hay crops in Alabama, D. G. STURKIE (*Alabama Sta. Circ. 79 (1937), pp. 20, figs. 4*).—A revision of Circular 58 (E. S. R., 65, p. 331) with similar, although slightly amplified, conclusions.

[Field crops work in Delaware], G. L. SCHUSTER and C. E. PHILLIPS (*Delaware Sta. Bul. 207 (1937), pp. 12–18*).—Progress reports are made on fertilizer experiments with wheat and barley, pasture improvement work, fertility rotation experiments, trials of barley varieties and soybean selections, and breeding work and inheritance studies with wheat.

Annual bluegrass (Poa annua L.) and its requirements for growth, H. B. SPRAGUE and G. W. BURTON (*New Jersey Stas. Bul. 630 (1937), pp. 24, figs. 4*).—Conditions under which annual bluegrass makes most satisfactory growth and factors responsible for its invasion of turfed areas and replacement of preferred grasses were studied, 1930–34. Characteristics and growth habits are described. See also an earlier note (E. S. R., 63, p. 225).

Encroachment of annual bluegrass, as shown by field experiments, is not favored by thick turf of creeping bentgrass, high soil acidity, aggressive strains of bentgrass, or by lead arsenate applied to turf for insect control. Its shallow root development on many areas indicates soil conditions unfavorable for permanent turf grasses. The bluegrass by natural reseeding, after some improvement of soil conditions, reoccupies areas where permanent grasses have failed. This bluegrass evidently may be controlled by correcting poor soil aeration, strong soil acidity, and lack of soil fertility, and by reseeding with desirable grasses in August and September.

In controlled pot experiments, annual bluegrass was weakened by pH 5.3 or lower and was favored by abundant phosphates, nitrates, and calcium, and avoidance of heat and drought or heat and poor soil aeration. Seed head production was reduced by heavy nitrogen applications which stimulated growth of leaves and stems, and by liming, and was favored by phosphates and potash and by days with 10 hr. instead of more sunlight.

In general, stronger top growth, as measured by clippings, was associated with a denser sod. Heavier nitrogen treatment produced more clippings without increase in sod density, while limited nitrogen produced fewer clippings but denser sod. Full sunlight was less favorable to annual bluegrass in July and August than was continuous light shade. Since the temperature was lower and humidity higher in the shade, annual bluegrass obviously is not well adapted

to conditions in the open in summer. From mid-August on, conditions were favorable for young plants.

In studies on nutrient requirements of annual bluegrass in sand cultures, nitrate nitrogen was preferable to ammonium nitrogen in acid solutions. Sodium nitrate increased growth of tops and roots, whereas ammonium sulfate actually reduced growth. With solutions corrected for acidity, ammonium nitrogen was slightly stimulating to tops but not to roots, and did not increase total growth. Colonial bentgrass and annual bluegrass grown in nutrient solutions responded similarly to acidity and the form of nitrogen supplied. The bentgrass made slightly the better use of ammonium nitrogen in both acid and neutral solutions.

"Apparently the invasion of turfed areas by annual bluegrass occurs not because of its greater tolerance of unfavorable nutrient supply but because of the ease of reestablishment of the bluegrass by seed in seasons when unfavorable soil conditions have been temporarily corrected by moderated weather conditions."

Effect of fertilizers on yield and malting quality of Manitoba barley, J. W. Hopkins (*Sci. Agr., 17 (1936), No. 4, pp. 250–259, figs. 2; Fr. abs., p. 259*).—Field experiments at Manitoba Agricultural College in 1926 and 1927 by T. J. Harrison indicated that barley yields from summer-fallowed land were unlikely to be increased materially by top dressings of phosphatic, potassic, or nitrogenous fertilizers, even in large amounts. Addition of nitrogen might in some seasons result in lodging and also increase the nitrogen content of the grain. Phosphate and potash increased the average size and weight of kernels. On stubble land in 1927, residual increments of nitrogen from 1926 fertilizing resulted in marked increases in grain yield (without corresponding increase in protein content) and some improvement in weight and volume per 1,000 kernels, suggesting that in districts of sufficient rainfall, economic yields of low-nitrogen barley might be secured from stubble land by moderate fertilization.

The cleaning and handling of barley, J. G. Malloch (*Sci. Agr., 16 (1936), No. 6, pp. 289–321, figs. 30; Fr. abs., p. 321*).—Barley cleaning and handling practices in Canada were investigated by a survey supplemented by laboratory experiments and information from importing and competing countries. Barley evidently can be cleaned to any desired degree of purity with machinery currently available. Malt-house cleaning systems are said to be most complex and efficient in America, simplest in England, and intermediate in continental Europe. Peeling or skinning barley decreases its malting value. In 1934, peeling damage was greater at threshing than any other stage of marketing. No damage could be attributed to cleaning or handling in country or terminal elevators, although it was shown that damage may occur in the latter. Susceptibility to subsequent damage was shown to be increased by rough handling, low moisture content of grain, or low atmospheric humidity. Varieties were found to differ in their susceptibility. Different types of cleaning devices and methods of reducing the current high level of damage are discussed.

Some results of differential feeding by corn root systems, V. E. Spencer (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 269, 270, fig. 1*).—When localization of nutrients was carried to an extreme in Nevada Experiment Station experiments, as in a complete segregation of various nutrients supplied to corn fed differentially, the plants had difficulty in adapting themselves to this condition. The total growth was reduced markedly and severe localized injury was manifested in top growth.

The life-history of Chenopodium album Linn., H. R. BHARGAVA (*Indian Acad. Sci. Proc.*, *4 (1936), No. 3, pp. 179–200, figs. 79*).—This life history study on lambsquarters is a contribution from Agra College.

A histological study of stalk-breaking in maize, J. W. HUNTER and N. E. DALBEY (*Amer. Jour. Bot.*, *24 (1937), No. 8, pp. 492–494, figs. 2*).—Inbred lines of corn differing in lodging behavior (breaking due to weak stalks) were studied in the field and in the laboratory at the Kansas State College. Correlations were found between anatomical structure and field behavior. Strong-stalked lines possessed thick layers of deeply stained sclerenchyma, both around the vascular elements and in the subepidermis, and had angular cells with small intercellular spaces.

The classification of the cottons of Asia and Africa, J. B. HUTCHINSON and R. L. M. GHOSE (*Indian Jour. Agr. Sci.*, *7 (1937), No. 2, pp. 233–257, pls. 3, figs. 28*).—Indigenous and naturalized cottons of India and Africa have been classified on the basis of Hutchinson's classification of Asiatic cottons in Harland's monograph (E. S. R., 69, p. 344). Cultivated Asiatic cottons are classified as *Gossypium arboreum* varieties *typicum*, *neglectum*, and *cernuum*, and *G. herbaceum* varieties *typicum*, *frutescens*, and *africanum*. *G. arboreum typicum* and *G. arboreum neglectum* are divided on geographical grounds into the forms *bengalensis*, *burmanica*, *indica*, and *soudanensis*. Cultivated New World cottons are grouped according to Harland's scheme—*G. hirsutum*, *G. religiosum*, and *G. barbadense*. Wild cottons, including *G. stocksii* of Sind and Arabia, *G. anomalum* of Somaliland and the Sudan, and *G. bakeri* from Sind, are described, and the distribution of the Asiatic species, the present status of New World species in India and Africa, and other classifications are discussed.

Motes in cotton.—II, Punjab desi cottons, M. AFZAL (*Indian Jour. Agr. Sci.*, *7 (1937), No. 3, pp. 487–495*).—In a further study (E. S. R., 72, p. 177) the number and position of motes were determined in the locks of 10 Rosea (*Gossypium neglectum rosea*), 15 Mollisoni (*G. indicum mollisoni*), and 12 Sanguineum (*G. sanguineum*), important desi varieties of cotton. In desi cottons, motes totaled much fewer than in American cotton but their disposition in various seed positions was similar and they were fewest in the center of the locks. Early and late pickings had more motes than middle pickings. Indications were that defective nutrition of developing ovules is the most important cause of mote production.

Variation in the characters of cotton in relation to the position of bolls on the plant, K. R. SEN and M. AFZAL (*Indian Jour. Agr. Sci.*, *7 (1937), No. 1, pp. 35–47, fig. 1*).—From studies with 45 F Punjab-American cotton, bolls seem to have a critical age within which the odds are heavily against survival to maturity. The boll-shedding percentage at any time during blooming seemed to depend almost directly on the mean moisture percentage of the atmosphere. The data showed that fiber properties do not depend on the position of the boll on the plant as such, all fluctuations observed being explicable as effects of climate.

The potato: Its culture, uses, history, and classification, W. STUART (*Chicago: J. P. Lippincott Co., 1937, 4. ed., rev., pp. IX+XV+508, pls. 4, figs. 267*).—This is a revised edition of the textbook previously noted (E. S. R., 59, p. 889). The major changes consist of a revision of statistical data; the addition of information to the chapters dealing with storage, diseases, insect and animal pests, fungicides and insecticides, and industrial uses of potatoes; and more extensive changes on the chapters on breeding and selection and classification and description of commercial varieties.

The interrelation of size of seed piece and rate of application of fertilizer in the production of potatoes in Alabama, L. M. WARE (*Amer. Potato Jour., 14 (1937), No. 12, pp. 375–382; abs. in Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 429*).—Yields per acre, cost per acre for materials, cost of potatoes per bushel, and net returns per acre are given from an Alabama Experiment Station study involving rates of application of fertilizer of 1,000, 1,500, and 2,000 lb. per acre, with seed pieces weighing ½, ¾, 1, and 1½ oz., all spaced 16 in.

The highest yield of No. 1 potatoes at each rate of fertilizer application usually was made with 1½-oz. pieces, although at the 1,000-lb. rate only a small gain in yield came from increasing the seed size from 1 to 1½ oz. The highest returns above cost of materials were obtained from using 1,500 lb. per acre of fertilizer and 1½-oz. pieces. The cost of potatoes per bushel was determined largely by a proper balance between the quantity of fertilizer applied and the size of seed piece.

Interrelation of spacing of seed piece and rate of application of fertilizer in the production of potatoes in Alabama, L. M. WARE (*Amer. Potato Jour., 14 (1937), No. 11, pp. 355–362; abs. in Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 429*).—In a related experiment with the same three fertilizer rates per acre as above, spacings of 1-oz. seed pieces were 20, 16, 12, and 8 in. The highest yield of No. 1 potatoes at the 1,000- and at the 1,500-lb. fertilizer rates was produced with 12-in. spacing, while the 2,000-lb. rate made the highest yield with 8-in. spacing. The largest net returns were obtained from 2,000 lb. of fertilizer and a 12-in. spacing. The need was shown for a balance between the quantity of fertilizer applied and the quantity of seed used.

Bibliography on rice and rice culture, II [trans. title], M. KONDŌ, R. TAKAHASHI, Y. TERASAKA, and S. ISSHIKI (*Ber. Ōhara Inst. Landw. Forsch., 7 (1937), No. 4, pp. 573–594*).—The list published earlier (E. S. R., 68, p. 612) is supplemented by 393 additional titles.

The classification of the autumn rices of the Punjab and western United Provinces, K. RAM and R. B. EKBOTE (*Indian Jour. Agr. Sci., 6 (1936), No. 4, pp. 930–937*).—The characteristics of 41 types of autumn rices are presented with a determinative key.

Scent in rice, K. RAMIAH (*Madras Agr. Jour., 25 (1937), No. 6, pp. 173–176*).—Scented rices are characterized by an odor emitted at the time of boiling the grain, which is evident even in empty glumes and dehiscing anthers. The odor was found to be a Mendelian character controlled by either one or probably two factors. In one hybrid progeny, the odor was associated with color.

Nodulation of soybeans in pot culture by effective and ineffective strains of Rhizobium japonicum, E. W. RUF and W. B. SARLES (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 724–727, figs. 2*).—Pot experiments with Manchu soybeans made in both fall and spring at the University of Wisconsin showed that three effective strains of *R. japonicum* (Nos. 9, 18, and 505) produced relatively few large nodules, most of which were on or close to the taproot near the soil surface. An ineffective strain produced many small nodules scattered over the entire root system, although it produced a greater number, volume, and weight of nodules on each plant than the effective strains.

Sugar-beet seed production studies in southern New Mexico, 1931–1936, J. C. OVERPECK, H. A. ELCOCK, W. B. MORROW, and R. STROUD (*New Mexico Sta. Bul. 252 (1937), pp. 28, figs. 5*).—Continued experiments in cooperation with the U. S. D. A. Bureau of Plant Industry in general confirmed those reported earlier (E. S. R., 69, p. 362). Production practices indicated included planting early in September at an acre rate of 18 lb. with 22-in. rows unthinned and frequent irrigation during the blooming period. Fertilizer practice depends

on soil type and general state of fertility. On heavy fertile soils already manured heavily for beet seed growing, phosphate or nitrogen carriers alone or supplementing manure did not show benefit. Greater response to maunre came on loam or sandy loams and to phosphate on sandy loam. In general, the use of 10 tons or more of manure per acre seems warranted, to be supplemented by phosphate if justified by the cropping history and phosphorus availability in the soil types. Early spring applications of nitrogen carriers to supply from 40 to 50 lb. of nitrogen per acre have been profitable.

Methods of growing the crop are described briefly.

On some of the factors that influence the error of field experiments, with special reference to sugarcane, W. Sayer and P. V. Krishna Iyer (*Indian Jour. Agr. Sci., 6 (1936), No. 4, pp. 917–929*).—An analysis of yields of Co. 210 from 968 plats of ¹⁄₂₄₂ acre (60 × 3 ft.) showed that the error of field experiments is governed partly by the size and shape of the plats. The percentage variations could be diminished by increasing plat size up to ⁹⁄₂₄₂ or ¹⁄₂₇ acre, and the error diminished slightly by increasing the length : breadth ratio up to a limit of about 30, although in practice a length from 5 to 15 times the breadth may be convenient. While number of replications needed depends upon percentage variations, for land of average variability from 6 to 9 will suffice.

Sampling of sugarcane for chemical analysis, I, R. Narain and A. Singh (*Indian Jour. Agr. Sci., 7 (1937), No. 4, pp. 601–625, figs. 4*).—While sampling is the major factor influencing the results of analysis, considerable error may result from variations in conditions of extraction. When data from chemical analysis of 4 varieties of cane were used to construct series of sample units of various sizes, variations in the different constituents of the same variety as well as similar constituents of different varieties tended to decrease with the increase in sample size. For ordinary analysis of juice, a sample of 10 stools picked at random from the entire field will give results accurate enough for routine analysis. For still greater accuracy, 10 replicate samples each of 10 stools will meet requirements fairly well. For results to be expressed as percentage on cane and also when a reliable estimate of juice percentage is required, a sample of 25 stools is needed. Data for sucrose and total solids were found accurate within a range of about ±0.5 and for glucose within ±0.10 when a 9-stool sample was taken and those of juice percentage within ±1.5 with a 24-stool sample. Limits of accuracy for the mean of 10 samples of 9 stools each will be ±0.13 for juice, ±0.14 for total solids, and ±0.17 for sucrose.

The error in grain yield attending misspaced wheat nursery rows and the extent of the misspacing effect, G. A. Wiebe (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 713–716, fig. 1*).—The error in grain yield per row resulting from misspaced 12-in. drilled nursery rows of wheat in a study at the Aberdeen, Idaho, Substation amounted to 3.8 percent per inch for each inch the rows were misspaced. The regression of yield on space was linear over the range, from 7 to 17 in., of spacings studied. Yields of rows once removed from the varying space were not affected significantly. Where the gain and loss of space on opposite sides of a row are equal, it was observed, no error in yield is introduced.

The effect of soil treatment in stabilizing yields of winter wheat, L. B. Miller and F. C. Bauer (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 728–734, figs. 2*).—Examination of wheat yield data recorded for a 15-yr. period ended 1935 from 18 soil experiment fields in Illinois (E. S. R., 76, p. 164) revealed that fertile, well-drained soils produced high average yields of wheat with a high degree of regularity from year to year, while untreated infertile soils were very irregular in wheat production. Except sandy land and hilly land, all

other poor or intermediate soils studied showed a high degree of improvement in stability of wheat production when treated to maintain a fairly high production level. Although occasional wheat failures or near failures occurred even on the most productive soils and under approved farming methods, good farming was rewarded by higher wheat yields as well as by fewer seasons of crop failure.

The effect of date of sowing upon the comparative performance of two wheat varieties, W. H. HORNER (*Sci. Agr., 17 (1937), No. 8, pp. 502–514, figs. 4; Fr. abs., p. 514*).—Marquis and Reward spring wheats sown in replicated plats at nine weekly intervals, 1932–35 (E. S. R., 74, p. 633), responded differently to seedings at several dates. The difference in response varied somewhat in different seasons but usually when sown early Marquis outyielded Reward, while in late plantings Reward yielded higher, attributed to Marquis having shorter spikes in late than in early sowings. The spike length of Reward was affected very little, number of spikes per foot causing most of the variation in its yield. The results are considered to ascribe a new significance to fundamental reactions of varieties to variations in environment, and to suggest use of yield analysis to indicate adaptation limits of varieties.

The 14-inch deep-furrow wheat drill tests, L. E. THATCHER and R. D. LEWIS (*Ohio Sta. Bimo. Bul. 189 (1937), pp. 157–163*).—Wheat was sown, 1929–34, in a number of localities in Ohio with the 14-in. disk type deep-furrow drill in comparison with the ordinary 7- or 8-in. grain drill so as to provide different row spacings and rates and dates of seeding. At ordinary normal rates of from 6 to 8 pk. per acre there was little evidence of superiority of the furrow drill, and there were no clear-cut instances of its lessening winter injury. Claims of savings of fertilizer have not been confirmed by critical experiments. Other objections to the deep-furrow drill are poor seed coverage of oats on disked land or very moist plowed land, the greater utility of the ordinary drill, possibility of accelerating erosion on sloping land, and the roughness of the furrowed land over which binders, mowers, and other equipment are used.

The relative macaroni making quality of a number of durum wheat varieties, D. S. BINNINGTON and W. F. GEDDES (*Cereal Chem., 14 (1937), No. 3, pp. 293–304, figs. 2*).—Of 34 samples of durum wheats produced in western Canada during 1934 and 1935 and milled into semolina and macaroni made therefrom, only Mindum, Arnautka, several new Mindum-Pentad crosses, Pelissier, Akrona, and a Iumillo × Mindum cross produced macaroni of satisfactory commercial value from the viewpoint of color and appearance. No substantial difference was found in the cooking behavior of the samples tested. Little, if any, relation seemed to exist between carotenoid content of durum wheat and the color of macaroni produced.

The quality of rust-resistant hard red spring wheats under development in Canada, A. G. O. WHITESIDE (*Cereal Chem., 14 (1937), No. 5, pp. 674–682*).—The rust-resistant hard red spring wheats Thatcher, Renown, and Apex, recently available to growers of western Canada, are discussed as to milling quality. Test data so far accumulated indicated that they compare favorably with standard varieties under normal conditions for production of good milling wheat of Manitoba Northern type and are distinctly superior under rust epidemic conditions. The historical background, breeding program, and methods for evaluating quality are outlined briefly.

Results of seed tests for 1937, B. G. SANBORN (*New Hampshire Sta. Bul. 299 (1937), pp. 23*).—Percentages of germination and of purity are tabulated for 439 official samples of field crop seed collected from dealers in New Hampshire during the year ended June 30, 1937.

Agricultural seed, A. S. Lutman (*Vermont Sta. Bul. 427 (1937), pp. 20*).—The purity and germination guaranties and significant variations therefrom are tabulated and discussed from tests of 553 samples of agricultural seed collected from dealers in Vermont during 1937. The requirements under the Vermont agricultural seed law and seeding rates for certain field crops are discussed briefly.

Collection of native grass seed in the Great Plains, U. S. A., F. J. Crider and M. M. Hoover (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 24 (1937), pp. 15, figs. 14*).—Methods used by cooperators of the U. S. D. A. Soil Conservation Service are described and illustrated.

Production of seed of herbage and forage legumes, edited by R. O. Whyte (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 23 (1937), pp. 48, pl. 1*).—This international exchange of opinions and experiences on the technic of producing seed of leguminous herbage and forage plants includes, among other papers, discussions on alfalfa seed, by H. M. Tysdal; red clover, alsike, sweetclover, and lespedeza seed, all by A. J. Pieters; soybean seed, by W. J. Morse; and vetch seed, by R. McKee (all U. S. D. A.).

Technique of grass seed production at the Welsh Plant Breeding Station, G. Evans (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 22 (1937), pp. 36, pls. 7*).—Practices involved in multiplication of grass seed are described, with a list of bred strains of grasses and clovers released by the station.

The germination of seeds of Potamogeton, W. C. Muenscher (*Ann. Bot. [London], 50 (1936), No. 200, pp. 805–821, figs. 11*).—A contribution from Cornell University.

Creeping yellow cress: A weed in process of entrenchment, H. Groh (*Sci. Agr., 16 (1936), No. 6, pp. 331–334, fig. 1*).—The distribution of *Rorippa sylvestris* in Canada and the United States is indicated, with tentative control measures.

A study of some ingredients found in ensilage juice and its effect on the vitality of certain weed seeds, W. T. Tildesley (*Sci. Agr., 17 (1937), No. 8, pp. 492–501; Fr. abs., p. 501*).—The vitality of seeds of all 19 species of weeds except *Chenopodium album* was destroyed after 14 days in experimental silos in 1931 and after 9 days in 1932. *C. album* survived up to 21 days. Seeds in the top of the silos showed considerable germination. Chemical examination showed from 1.5 to 2 percent of organic acids present in silage juice. Seeds treated with approximate concentration of acetic and lactic acids completely lost vitality in 14 days whether kept in air or CO_2, and those treated with water in CO_2 showed complete loss of vitality. Concentrations of 2 percent acetic acid destroyed the vitality of *C. album* in 48 hr. and 0.25 percent in 6 days.

Eradication of Cynodon dactylon (hariali-doub grass) by tractor ploughing in the Bombay-Karnatak, S. S. Salimath, V. S. Kulkarni, and R. D. Gayatonde (*Agr. and Livestock in India, 7 (1937), No. 4, pp. 479–492, pls. 3*).—The control of Bermuda grass by tractor plowing is reported.

Control of weeds in lawns with calcium cyanamide, D. G. Sturkie (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 803–808*).—In further studies at the Alabama Experiment Station (E. S. R., 68, p. 759), calcium cyanamide applied to Bermuda grass lawns in the winter was very beneficial because of the removal of annual weeds and also the stimulation from the nitrogen supplied, which continued throughout the summer, obviating additional nitrogen fertilization. Perennial weeds usually were not killed by the chemical. Bermuda grass sometimes was temporarily injured, but the treatment finally was decidedly beneficial. Preferably the granular form should be applied in January or early February at rates of from 1,000 to 2,000 lb. per acre with the weeds either wet

or dry. If the treatment is divided, the first application can be made in December or January and the second in January or February. It usually is not desirable to kill Italian ryegrass on lawns with cyanamide. Cyanamide treatment should be confined to Bermuda grass and not applied to bluegrass or other lawns; it should not touch foliage or shrubbery; and should not be used around pines or other plants that require acid soil.

Chemical weed killers: A review, W. H. Cook and A. C. Halferdahl (*Canada Natl. Res. Council Bul. 18 (1937), pp. 111*).—Literature embracing 339 titles is reviewed critically to establish the relative toxicity of different chemical compounds, to collate available information on proved herbicides, and to determine what chemicals might profitably be studied further as possible weed killers. The results, expressed in text and convenient tables, are classified according to chemicals, in alphabetical order of anions, and then according to observational, field, or laboratory experiments. References not cited, numbering 311, are also included.

HORTICULTURE

[Horticultural investigations by the Delaware Station] (*Delaware Sta. Bul. 207 (1937), pp. 33–36*).—Among studies the progress of which is reviewed are: Physiological dropping of fruits in Delaware.—III, In relation to plum curculio stings, premature flowerstalk in cabbage as related to position of seed branch on the mother plant, chemical composition in relation to physiological behavior in cabbage, and testing of blight-resistant pears and New Jersey varieties of peaches, all by L. R. Detjen and E. W. Greve; and comparison of apple varieties on seedling and own roots, carbohydrate-nitrogen relationships in the Jonathan apple as influenced by nitrogen treatments, and a study of the value of various English rootstocks for the Blaxtayman and Gallia Beauty apple trees, all by F. S. Lagassé.

[Horticultural investigations conducted by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 352 (1937), pp. 38, 40, 45–51*).—Included are brief reports on the following experiments: The use of various materials with composted horse manure for mushroom growing, by J. W. Sinden; the genetics of phlox, by J. P. Kelly; fertilizers for vegetables, by W. B. Mack; fertilizers for asparagus, and new varieties of vegetables, both by Mack and G. J. Stout; the inbreeding of sweet corn, by C. E. Myers and M. T. Lewis; the breeding of lettuce, by Lewis; cabbage and tomato breeding, by Myers and Lewis; the effect of ringing on the apple tree, by F. N. Fagan; the insulation of fruit storage houses, by R. D. Anthony and Fagan; rootstocks and winter injury of apples, by Anthony and W. S. Clarke, Jr.; testing of ornamental plants such as roses and various shrubs, by R. P. Meahl; heredity in the snapdragon, by Lewis; variety and strain trials of peas, beans, and celery, by Mack and F. W. Haller; and sweet corn and tomato variety and strain trials, by Mack, Stout, and Haller.

[Horticultural studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1936, pp. 23–30, 39, 40, 44, 45, 47, 48–55, 69–72, 89, 91–93, 94, figs. 4*).—Among studies discussed are those relating to vanilla production and processing; vanilla pollination; bamboo introduction, propagation, and utilization; selection and breeding of the calabaza; testing of East Indian onions and cucumbers from regions of comparable photoperiod and climate; breeding and culture of sweet corn, including nitrogen fertilizer tests; root development of sweet corn in different soils; testing of coffee species and varieties; shade requirements of coffee; chemical composition of different mango varieties; introduction and testing of *Cinchona;* introduction of mangoes; and testing of ilang-ilang, *Canangium odoratum.*

Carbon dioxide storage, IX, X, N. C. Thornton (*Contrib. Boyce Thompson Inst., 8 (1936), No. 1, pp. 25–40; 9 (1937), No. 2, pp. 137–148, figs. 2*).—Continuing this series (E. S. R., 74, p. 464), two papers are presented as follows:

IX. *Germination of lettuce seeds at high temperatures in both light and darkness.*—Investigations conducted during December, January, and February with seeds of both white- and black-seeded lettuce obtained early in December from a commercial source showed that in the presence of carbon dioxide good germination may be secured in light or darkness at temperatures as high as 35° C. (95° F.). At from 20° to 26°, from 5 to 20 percent of carbon dioxide and 20 percent of oxygen induced germination within 17 hr. At 35°, a higher percentage of carbon dioxide and more hours were required. Seeds forced into germination by carbon dioxide produced good plants which grew well when transferred to air.

X. *The effect of carbon dioxide on the ascorbic acid content, respiration, and pH of asparagus tissue.*—The ascorbic acid (vitamin C) content of asparagus tissue was reduced from 8 to 52 percent by storage in an atmosphere containing carbon dioxide, either added purposely or allowed to accumulate during respiration. Loss of ascorbic acid was greatest in the bud tissue but occurred also in the stalk. Loss was most rapid shortly after exposure to carbon dioxide, and occurred during or following storage over a wide range of temperatures (from 2° to 27° C.) There was no recovery of ascorbic acid upon exposure to air. The H-ion concentration was decreased during the period of treatment with carbon dioxide, but the acidity returned to the original values upon removal to air. It was thought likely that the accumulation of end products from some associated metabolic processes brings about the destruction of ascorbic acid without the aid of oxygen from the external atmosphere.

A preliminary study of the relationship between vitamin C content and increased growth resulting from fertilizer applications, B. Isgur and C. R. Fellers (*Jour. Amer. Soc. Agron., 29 (1937), No. 11, pp. 890–893*).—Studies at the Massachusetts Experiment Station of the effects of fertilizer treatments on the ascorbic acid content of New Zealand spinach and Swiss chard growing in 1-gal. glazed crocks showed, in general, in the case of the chard that ascorbic acid per gram of dry matter apparently increased as the yield increased. The high nitrogen treatment resulted in the highest yield of ascorbic acid. On the other hand, in the New Zealand spinach, increased yields were not accompanied by any increase in ascorbic acid. No evidence was obtained that the use of properly balanced fertilizers decreases ascorbic acid content.

Quantitative studies of form and size in certain vegetables, W. B. Mack and W. H. Lachmann, Jr. (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 510–522, fig. 1*).—Measurements made by the Pennsylvania Experiment Station of the heads of varieties of cabbage, the fruits of different varieties and strains of tomato, and of the roots of varieties of beets indicated that certain numerical indexes, such as the ratio between axial and maximum transverse diameters, are more reliable for distinguishing between varieties and effects of treatments than are the usual measures of size and weight. The form of the cabbage head and of the tomato fruit was found to be influenced by seasonal and cultural conditions such as differential fertilizer treatment. Shape indexes were found to reveal differences among beet varieties more accurately than did the percentages of the different varieties which fell into arbitrary shape classes.

Some observations on the use of manure pots in growing cabbage and tomato plants for setting in the field, E. W. Greve (*Peninsula Hort. Soc. [Del.] Trans., 50 (1936), pp. 20–23*).—Comparisons at the Delaware Experiment Station of three containers—manure pots, clay pots, and wooden flats—for the

growing of tomato and cabbage plants prior to field setting showed the manure pots, despite their composition, to be the least useful from the viewpoint of production of vigorous plants capable of early blooming in the field. With cabbage, where a comparison was made between manure pots and flats, the flats again proved decidedly superior.

The soil fertility factor in pickle and cabbage soils, C. E. MILLAR (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 7, p. 210*).—The author points out that the chief soil deficiency is apparently a low humus content which may be improved by applications of manure or growing legumes, such as alfalfa, clover, or sweet clover. For pickling varieties, a rapid, early growth of vine and early fruit may be attained by the use of a commercial complete fertilizer rather high in nitrogen and phosphorus. Cabbage is said to require higher fertility than the cucumber, but for such uses as kraut manufacture the use of too much nitrogen in the fertilizer tends to promote loose, soft heads with too low sugar content.

Temperature: Cold injury curves of fruit, J. E. VAN DER PLANK and R. DAVIES (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 3, pp. 226–247, figs. 14*).—Observing, at the Low Temperature Research Laboratory, Capetown, South Africa, that the breakdown of plums, the woolliness of peaches, and the pitting of March grapefruit in cold storage occurred more abundantly at intermediate temperatures than at low or high temperatures, the authors suggest that the peak of injury apparently results from the interaction of two opposing factors characterized as the equilibrium factor and the kinetic factor. However, the temperature of maximum injury was labile and was influenced by the natural resistance of the fruit, the length of storage period, and the rate of manifestation of injury. Changes in the fruit during storage resulted in a further development of susceptibility to injury, changes referred to by the authors as secondary susceptibility. However, the factors which predispose fruit to secondary susceptibility are apparently not directly related to those causing primary susceptibility.

A note on the use of α-naphthalene acetic acid for rooting soft-wood cuttings of fruit tree stocks, H. L. PEARSE and R. J. GARNER (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 3, pp. 248–251, pl. 1*).—At the East Malling Research Station preliminary tests on small numbers of softwood cuttings of certain plum and pear rootstocks and of black currant and fig indicated that the immersion of the bases of the cuttings for 12 hr. in from 30 to 40 p. p. m. α-naphthalene acetic acid stimulated rooting markedly.

Annual cover crops for Michigan orchards, N. L. PARTRIDGE and W. TOENJES (*Michigan Sta. Circ. 163 (1937), pp. 12, figs. 5*).—Based on orchard tests in Michigan and elsewhere and upon recently published data from related fields of work, the authors discuss the comparative advantages of sod and cultivation, the value of orchard cover crops, choice of cover crops, the best time for seeding, competition between trees and cover crops for moisture and plant foods, and the necessity of having cultivation cross rather than extend up and down the slope.

Some experiences with irrigating Indiana orchards in 1934, C. E. BAKER (*Ind. Hort. Soc. Trans., 1934, pp. 51–56*).—Prefacing the discussion with information relating to water relations of the soil and tree, the author states that in tests conducted by the Indiana Experiment Station with 17- and 23-year-old Grimes Golden trees growing on a sandy clay soil into which water penetrated easily, there was no significant difference in size of fruit resulting from three irrigations totaling 1,250 and 1,650 gal. per tree in the two age groups, respectively. The finish of the fruit was better on the irrigated trees, es-

pecially on Jonathan and Rome trees receiving similar treatment. The use of straw mulch, applied annually for several seasons, is suggested as a more economical and practical treatment than irrigation.

Studies on new varieties of apple rootstocks, H. M. Tydeman (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 3, pp. 165–190, pl. 1, figs. 3*).—Seedlings from a cross made in 1923 of Malling VIII with Malling IX stocks, both characterised by their relatively extreme dwarfing effect on the scion, were studied at the East Malling Research Station with respect to their influence on Lane Prince Albert scions. There was noted an extremely wide range in vigor, whether expressed in terms of new wood, increment in diameter of stems, or ultimate weight of the trees. Some of the seedlings were more dwarfing than the Malling IX and some more vigorous than Malling VII. A close correlation was observed between vigor of the scion and the size of the swelling at the union. In terms of blossom production, the more dwarfing the stock the greater the productive capacity of the trees in their early years. Fruiting records correlated closely with blooming records. As to the effect of stock on the relative susceptibility of the scion to various disease and insect pests, there was little evidence of any direct influence. It was observed that there was a somewhat obscure correlation between the vigor of the tree and the relative freedom from scab.

Injection of apple-trees in New Zealand, J. D. Atkinson (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 11, pp. 797–799*).—Compounds of some 25 different elements were injected in solution form into the trunks of 22-year-old Jonathan trees. Most of the materials produced no visible reaction, but injury occurred where trees were treated with 8 g of ferrous ammonium sulfate, cadmium chloride, nickel chloride, silver nitrate, and lead acetate. Borax and boric acid caused damage when used at the rate of 16 g per tree, irrespective of the volume of solvent. Where 4, 8, or 16 g of borax or boric acid were used on trees susceptible to severe attack by corky pit, practically every apple developed without evidence of pitting. Potassium iodide caused severe defoliation and fruit drop at 2 g and death at 8 g.

Some observations and current studies of winter injury to apple, J. H. Waring and M. R. Hilborn (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 52–56, figs. 3*).—A survey in the summer of 1934 showed 40.3 percent of the bearing trees in 889 Maine commercial apple orchards to have suffered low-temperature injury in the preceding winter. Some of the definitely tender varieties were Baldwin, Ben Davis, Gravenstein, King David, Northern Spy, Tolman, St. Lawrence, Stark, and Winter Banana. Determinations of relative hardiness by artificial freezing methods gave results in close accord with those observed in the orchards. A delay in injury effect was observed in McIntosh, where patches of dead bark on the trunks were not observed until the spring of 1935. A type of crown injury was noted, particularly on young McIntosh and Cortland trees, in the spring of 1936. A beginning was made in the testing of various hardy understocks, such as Virginia Crab, Hibernal, Haas, Sheriff, and Antonovka, for use as roots and as intermediate stocks.

Spray residue removal from cherries, H. C. McLean and A. L. Weber (*Jour. Econ. Ent., 30 (1937), No. 5, pp. 777–779*).—As reported by the New Jersey Experiment Stations, a solution of 1 percent by weight of hydrochloric acid was successful in removing sulfur, lead, and arsenic residues from sour cherries. The washed fruit not only had a better appearance but kept equally as well as the unwashed fruit. The addition of a small amount of a wetting agent to the acid wash enhanced the appearance of the fruit.

Classification and evaluation of varieties of peaches grown in the Northeastern States (*Md. Fruit Grower, 7 (1937), No. 11, pp. 7*).—Herein are presented the results of a survey by a committee of research pomologists representing 11 of the Northeastern States. Elberta proved to be the outstanding commercial peach, with a Class 1 rating by 10 States. Golden Jubilee was second, wih a Class 1 rating by 7 States.

New package for peaches (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, p. 84*).—A description is presented of a ventilated package which permits the rapid cooling of all the peaches in a loaded refrigerator car.

Cold injury to strawberry plants, G. M. Darrow (*Hoosier Hort., 19 (1937), No. 11, pp. 163–165*).—Based on the results of observations in a study of plants obtained from different parts of the country, the author concludes that low temperature injury in late fall and winter to the crowns and roots of strawberries is one of the important sources of loss to growers in all of the Northern States. The advisability of early mulching with straw or other materials is stressed.

Some notes on avocado flower, J. P. Torres (*Philippine Jour. Agr., 7 (1936), No. 2, pp. 207–227*).—Information is presented on the habit of flowering in the Pollock Tertoh, and Wester varieties of avocado and on the period of dehiscence in the Commodore, Cyrus, Pollock, and Wester. The Commodore and Miami varieties were found self-fruitful. Some varieties were found cross-incompatible, some were compatible in one direction only, and others were capable of successful pollination in both directions.

The relation of foliage to tree maintenance and fruit production, B. R. Fudge (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 14–18*).—Stating that approximately one-half of the citrus plant consists of carbon in organic combination which has been manufactured in the leaves, and that more than 30 chemical elements may be found in the ash of the citrus leaves, the author stresses the importance of maintaining abundant healthy foliage on the citrus tree and the adoption by growers of cultural practices that encourage vigorous leaf development.

Major plant food elements for citrus, R. M. Barnette (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 4–9*).—Discussing briefly the role of various elements in plant nutrition, the author presents data on the pounds per acre of nitrogen, phosphoric acid, potassium, and calcium that may be found in a virgin soil such as is generally used for citrus growing and on the average yearly losses that occur by leaching and by utilization by the tree, its fruit, and the cover crop in a 19-year-old Marsh grapefruit grove. The minimum applications of nitrogen, phosphorus, and lime required to maintain a producing grove of the above characteristics are set forth with comments.

Total pectinous material in the vegetative portions of citrus trees, A. R. C. Haas (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 84–87*).—Preliminary determinations by the California Citrus Experiment Station at Riverside on a number of leaf and bark samples of various stocks and scions collected at various times showed a relatively high content of pectinous material. No significant differences were found between the pectinous material of healthy or mottled leaves, nor was any effect of soil fertilization evident. The bark of the stock contained, usually, a lower percentage of total pectinous materials than did the bark of the scion. In most cases, bark collected in October contained a lower percentage of pectinous material than did comparable December samples. The high content of total pectinous materials in lemon and grapefruit bark samples paralleled that of the fruits of these species.

Growth of citrus trees, F. F. Halma and C. Compton (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 80–83, figs. 3*).—Measurements by the California Citrus

Experiment Station at Riverside of the trunks of Washington Navel oranges planted in 1930 and of Eureka lemons planted in 1932 showed that about 90 percent of the annual growth of the orange trees occurred between May and November and of the lemons from March to December. The growth period was not influenced by the rootstock or the soil-moisture conditions, but soil temperature appeared to be the important limiting factor determining length of the growth period.

A progress report on the influence of heat and smoke on the development of Carabao mango buds (*Mangifera indica* L.), F. G. GALANG and J. A. AGATI (*Philippine Jour. Agr., 7 (1936), No. 2, pp. 245–261, figs. 3*).—Comparing several treatments, including heat alone, smoke and heat, and precooled smoke, the authors conclude that the presence of gases and a certain amount of supplemental heat are required for the stimulation of mango buds (the Carabao variety). However, when heat and gases were excessive, only leaf buds were formed. When heat alone was applied only one plant responded, and this one had been severely injured by typhoon and insects.

Relation of shoot growth to setting and weight of fruit in the filbert, C. E. SCHUSTER (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 62–65*).—In this second paper (E. S. R., 72, p. 484), the author states that of 1,633 shoots upon which records were taken for four consecutive years, 50.2 percent were 5 cm or less in length. Of these only 6.3 percent were productive the first year, and the following season 376 were dead. Of the 49.8 percent shoots above 5 cm in length, only 128 died within a year and the blooming percentage was much higher. Shoots above 15 cm practically all bloomed. Apparently, in the unpruned filbert trees there are many short-lived and unproductive shoots.

The relationship between the length of the primary shoot and weight of nuts was not marked, but there was a correlation between number of nuts in a cluster and average weight. Nuts borne singly were much heavier than those in clusters of five or more, and the longer the shoot the heavier the individual nuts in any given cluster class. In no case was tree growth so vigorous as to become unfruitful.

Seasonal changes in the composition of pecan roots, J. G. WAUGH and C. L. SMITH (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 78, 79*).—Using lateral roots from alternate bearing, healthy trees growing near Austin, Tex., the U. S. Department of Agriculture observed that starch and hemicellulose are apparently the principal reserves. Both substances reached a maximum toward the end of the "off" year and decreased during the "on" year. Starch decreased rapidly during the period of vegetative growth, increased during shuck and shell formation, and decreased again during the period of nut filling and ripening. Hemicellulose decreased more gradually to a minimum value at nut drop. A fluctuation of reducing and nonreducing sugars indicated that they serve more as translocatable carbohydrates. Total nitrogen increased up to the beginning of the vegetative period of the on year. During nut development, nitrogen increased. An approximate correspondence was seen between starch and dry matter.

The specific gravity as related to kernel development in the pecan nut, L. D. ROMBERG, J. HAMILTON, JR., and C. L. SMITH (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 66*).—Studies with five varieties of pecans showed that as the specific gravity of the nuts increased the weight of the shell per cubic centimeter of nut volume increased relatively little, and the weight increase came largely in nuts with a specific gravity above 0.7. The ratio of kernel weight to weight of the whole nut did not indicate the degree of filling nearly as well as did the specific gravity, which in all cases was very closely correlated with the weight of kernel per cubic centimeter of nut volume or degree of filling.

Notes on the effects of soil management on the growth in diameter of pecan nuts, C. W. Van Horn (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 67–73, figs. 2*).—Studies conducted by the Arizona Experiment Station and the U. S. Department of Agriculture with Burkett trees planted in 1931 at Yuma and subjected to differential fertility and irrigation treatments showed that variation in cultural treatment produced significant differences in length and diameter of shoots and in the size and color of leaves. A single year's treatment did not entirely control these responses, due, presumably, to reserves within the trees. Weekly measurements of nuts in the several plats showed no notable difference in diameter development, though certain tendencies were discernible. With the beginning of the filling process, as indicated by the presence of a gel layer in some nuts, the rate of growth became slower on all plats. However, growth in diameter continued until just prior to harvest. The only conclusion drawn was that soil moisture alone does not govern growth in diameter of pecan nuts.

The use of ethylene to improve pecan harvesting, A. H. Finch (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 74–77, fig. 1*).—At intervals from the middle of September throughout the period of harvest, pecan nuts gathered by the Arizona Experiment Station were placed in reasonably airtight containers with an atmosphere containing ethylene with an approximate concentration of one part per thousand. Without exception, the shucks were loosened and were readily removed after from 24 to 48 hr. Ethylene had no effect on the coloring of the shells. Since, under Arizona conditions of high fall temperatures, optimum quality of the kernel may be attained before the shucks open naturally, the ethylene treatment may have real value. Some evidence was obtained that pecan shucks normally yield ethylene-like emanations.

Hardiness of Kniphofias, H. E. White (*Florists Exch. and Hort. Trade World, 89 (1937), No. 16, p. 12, fig. 1*).—Stating that there is considerable variation in different varieties and species of Kniphofias, the author discusses briefly the results of tests at the Waltham, Mass., Field Station of a number of species and horticultural varieties, and offers suggestions as to cultural requirements.

Greenhouse potted plants, G. H. Poesch (*Ohio Sta. Bul. 586 (1937), pp. 60, figs. 12*).—Outlining various important features in the construction and management of greenhouses, including the provision of adequate temperature and ventilation, the selection of soils, and soil sterilization practices, the author discusses the species of flowering plants usually grown in the greenhouse with relation to the better varieties and the specific cultural needs. Many of the suggestions given are based on investigations conducted by the station, and cover items such as soil reaction and plant food requirements, effects of supplementary illumination, water and temperature needs, methods of propagation, forcing practices, etc. In detailing the costs of production, labor was the largest item, being 45 percent of the total. Fuel was estimated at 10 percent.

FORESTRY

Textbook of dendrology, W. M. Harlow and E. S. Harrar (*New York and London: McGraw-Hill Book Co., 1937, 1. ed., pp. XIII+527, pl. 1, figs. 224*).—Prefaced with a brief discussion of the botanical characters, such as variations in leaves, flowers, twigs, and bark, that serve to distinguish species, the authors present descriptions of the more important commercial forest species of North America arranged by families and genera.

[Forestry investigations by the Department of Agriculture] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 102–105*).—Information is presented regarding the

administration of the national forests, the potential development of southern forest lands for timber and naval stores, the per capita consumption of paper in the United States, the value of sustained yields for private forest lands in cooperation with forest owners, and grazing of the national forests.

Woodland section of the manual (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-AP-12, pp. [3]+27*).—This mimeographed manual covers the plan of activities and objectives of the Woodland Section of the Division of Conservation Operations.

Proceedings of Second Annual Conference of Regional Nurserymen, St. Louis, Missouri, March 1–6, 1937 (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-TP-14, pp. [3]+87*).—This mimeograph contains, for the most part, papers presented by various regional leaders of conservation nurseries on progress in their respective areas.

Soil moisture content during critical periods in the regeneration of previously grazed farm woodlands, O. D. Diller (*Jour. Forestry, 35 (1937), No. 4, pp. 399–402, fig. 1*).—Six weekly determinations in summer of the soil moisture in the A, B, and C horizons in open-grazed woods, fully stocked woods, and open pasture land in Grant County, Ind., showed that in the A horizon the moisture was lower in the open-grazed woodlands than in either of the other two sites in 4 of the 6 weeks. In the B and C horizons the readings were lower in the grazed woodland in 5 of the 6 cases. The author suggests that the slight difference in the moisture content may become significant when the wilting point is approached. Since the moisture content was generally higher in the A and B horizons of the open field than in either of the woodland areas, he also suggests that the benefits of decreased run-off and evaporation must have been offset by transpiration of the trees.

The use of liquid humate fertilizers in forest nurseries, S. A. Wilde (*Jour. Forestry, 35 (1937), No. 4, pp. 388–392, figs. 2*).—Liquid humate, a suspension of humus obtained by treating forest litter with a complete fertilizer solution, was found by the University of Wisconsin to have a remarkably stimulating effect on the growth of forest seedlings, not only in increasing the rate of growth but also by increasing resistance to unfavorable environmental influences. The humate had a marked reviving influence upon stunted and weakened seedlings. The material must be used between the time of the latest killing spring frost and not later than from 6 to 7 weeks prior to the first autumn frost.

Plant nutrients and pine growth, S. L. Kessell and T. N. Stoate (*Austral. Forestry, 1 (1936), No. 1, pp. 4–13, pl. 1*).—In these investigations, conducted in Western Australia, it was found that the stunting of pines in new nurseries may be overcome by applying a dressing of soil from old pines or by spreading the fruiting bodies of *Rhizopogon luteolus* on the area. Ash analyses of the wood, bark, and needles from healthy and rosetted pines showed a much higher content of sodium oxide in the diseased plants. In spraying rosetted pines with solutions of the trace elements in the form of ferrous sulfate, chromium nitrate, cobaltic chloride, nickel chloride, zinc chloride, copper sulfate, manganese sulfate, and boric acid, only one treatment—zinc—had any beneficial effect. An immediate and striking response in color, length of needles, and restoration of growth followed the zinc treatment.

Secondary growth of white pine in relation to its water supply, L. Goldthwait and C. J. Lyon (*Ecology, 18 (1937), No. 3, pp. 406–415, figs. 2*).—Using the mean width of annual rings as a measure of secondary growth rate, groups of white pine trees growing near Dartmouth College, Hanover, N. H., were used in an analysis of the relations between growth rates and existing records

of temperature and rainfall. The total precipitation absorbed by the soil during the season for secondary growth was the dominant element in the complex of climatic factors. Temperature effects were confined chiefly to indirect action on the water content of the soil and to direct effects during April and May. Since the years marked by relatively wider or narrower rings of white pine are essentially the same as those observed in hemlock, it is suggested that the two species are about equally responsive to the dominant climatic factor of rainfall.

Relationship of southern cedar growth to precipitation and run off, F. M. HAWLEY (*Ecology, 18 (1937), No. 3, pp. 398–405, figs. 2*).—Having ascertained by borings of a number of species growing in eastern Tennessee and western Kentucky that pines, white oaks, red cedars, and arborvitae show the greatest sensitivity in ring growth and also the longest growth records, the correlation of cedar growth, precipitation, and stream run-off was computed from a restricted area in eastern Tennessee where most of the precipitation occurs in winter and where moisture records were available for several years. The correlation between unsmoothed cedar growth and unsmoothed water year precipitation proved highest, +0.695. The correlation between growth and calendar year was +0.649, all of which suggested a marked dependence of red cedar upon precipitation. The minima of cedar growth and the run-off curves coincided.

Direct seeding in the Lake States, H. L. SHIRLEY (*Jour. Forestry, 35 (1937), No. 4, pp. 379–387*).—Based on 11 years' experience, the author reports that the direct seeding of jack pine, red oak, and bur oak was successful on sites free from aggressive competing vegetation and from seed-eating rodents, providing the first two growing seasons were favorable. The most favorable results with jack pine were obtained by drilling in 0.25 lb. of seed per acre in plowed furrows. Although direct seeding was less costly than planting, subsequent care and replacements tended to offset this advantage.

Scarification and germination of black locust seeds, J. K. WILSON (*Jour. Forestry, 35 (1937), No. 3, pp. 241–246*).—Studies by the [New York] Cornell Experiment Station with seeds obtained locally and from California showed that, by treatment with concentrated sulfuric acid or with hot water, germination may be greatly augmented over that of untreated seeds. Immersion of seeds in boiling water for at least 2 min. was more effective than steeping in hot water allowed to cool to room temperature. The optimum duration of the sulfuric acid treatment varied with the different lots of seed, being 6 hr. in one case and 10 hr. in another.

The response to full release of white pine planted under jack pine, T. S. HANSEN (*Jour. Forestry, 35 (1937), No. 3, pp. 263–265*).—In a plantation of white pine established by the Minnesota Experiment Station in 1913 on the Cloquet Forest under a stand of 37-year-old jack pine, thinned in 1912 to 37 percent of a normal stand and clear-cut in 1924, height growth of the white pines during the 10-yr. period, 1925–35, averaged 0.9 ft. per year, as compared with 0.6 ft. in a comparable, unreleased control area. Weevil injury entered the picture and may have reduced the benefits of the release cutting.

Root development in Pinus pinaster and the seasonal variation of its mycorrhizae, N. T. BURBIDGE (*Austral. Forestry, 1 (1936), No. 1, pp. 32–40, figs. 2.*)—At Applecross, Western Australia, studies of the roots of *P. pinaster* showed mycorhizas present on all parts of the roots of nursery plants, while in older plants the organism was observed only on the horizontal roots. The author concludes that mycorhizas are ephemeral in nature, rarely lasting more than 1 yr. The growth period of roots, shoots, and mycorhizas was correlated closely with the duration of the rainy season.

Forest protection, R. C. Hawley *(New York: John Wiley & Sons; London: Chapman & Hall, 1937, pp. IX+262)*.—This text presents information relating to factors and practices involved in protecting the forests from injuries due to various causes, such as floods, drought, windstorms, fungi, insects, overgrazing, and forest fires.

Yield tables for trees 6.6 inches and more in diameter in even-aged stands of Sitka spruce and western hemlock *(U. S. Dept. Agr., Tech. Bul. 544 (1937), Sup., pp. [1]+8)*.—This mimeographed publication is a supplement to Technical Bulletin 544 (E. S. R., 77, p. 492).

Stumpage and log prices for the calendar year 1936, compiled by H. B. Steer *(U. S. Dept. Agr., Statis. Bul. 62 (1937), pp. 59, figs. 3)*.—This is the customary annual statistical report (E. S. R., 77, p. 636).

DISEASES OF PLANTS

The Plant Disease Reporter, November 15, December 1, and December 15, 1937 *(U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 21, pp. 377–389, figs. 2; 22, pp. 391–409, fig. 1; 23, pp. 411–432, figs. 2)*.—The following items of interest are included:

No. 21.—*Ascochyta sorghina* on Sudan grass, Johnson grass, and sorghums in Georgia, by J. L. Weimer, G. W. Burton, and B. B. Higgins; observations on diseases of apples, stone fruits, small fruits, potatoes, hay crops, tobacco, and ornamentals in Massachusetts for 1937, by O. C. Boyd; report of cotton anthracnose survey in Oklahoma, by T. B. Gordon; additional note on malachite green as a control agent for downy mildews, by F. P. McWhorter; and brief notes, including the first report of *Phytophthora* blight of lilac in Iowa and rusts on cereal crops in North Dakota.

No. 22.—Relative importance of winter injury and some other troubles to strawberry growers in Northern States, by G. M. Darrow and J. B. Demaree; the red stele root disease of strawberries in the northeastern United States, and leaf variegation in strawberries not considered a virus disease, both by J. B. Demaree and G. M. Darrow; *Verticillium* wilt of pepper, by B. A. Rudolph and W. C. Snyder; Illinois 1937 vegetable crop losses from disease, by K. J. Kadow; and losses from smutty wheat in the Pacific Northwest, 1930 to 1937, as shown by terminal inspection of car receipts, by B. W. Whitlock.

No. 23.—Additions to the check list of the parasitic fungi on cereals and other grasses in Oregon, 1935–37, by R. Sprague; tobacco diseases in western Kentucky in 1937, by E. M. Johnson; reports on plant diseases in Colorado, including yellows-resistant cabbage varieties for Colorado, *Phytophthora* blight of pepper, an undetermined root rot of corn, control of peach mosaic, and root rot of sweet peas in a greenhouse; rust on teosinte and wilt of pepper in Connecticut, by A. A. Dunlap; occurrence of vegetable diseases in tidewater Virginia this fall (1937), by H. T. Cook; fruit disease eradication activities, including citrus canker in Texas, peach mosaic in Mexico, and progress in control of peach mosaic and phony peach diseases; blister rust in California and the western white pine region; and notes on some insect vectors of plant diseases, including new distribution records for smaller European elm bark beetle *(Scolytus multistriatus)*, sparse stands of Russian-thistle favor breeding of beet leafhopper, and wild peppergrass principal summer host of beet leafhopper in Arizona desert.

[Plant disease studies in Delaware] *(Delaware Sta. Bul. 207 (1937), pp. 36–45)*.—Progress reports are included on the dissemination of peach yellows and little peach and factors in their control, and the masking of these two diseases in plums and other *Prunus* species, both by T. F. Manns and F. R. Davies;

chemical treatments of sweetpotato sprouts and slips, by Manns and J. W. Henberger; tomato foot rot (*Macrosporium solani*) control, and breeding tomatoes for disease resistance, both by Manns; and bacterial spot of stone fruits, diseases of cucurbits (including seed transmission of *Fusarium niveum* and its control by resistant varieties of watermelon, and tests of fungicidal dusts on cantaloups, cucumbers, and watermelons), and tests of spray materials in apple orchards, all by J. F. Adams.

Some bacterial diseases of plants in Illinois, H. H. Thornberry and H. W. Anderson (*Phytopathology, 27 (1937), No. 9, pp. 946–949*).—Five bacterial leaf spot diseases of plants were collected by the University of Illinois (1929) and the pathogens studied in pure culture. The symptoms of these diseases are brown, necrotic spots that possess a dark oily appearance in time but are circular and water-soaked at first. The five pathogens are *Phytomonas polygoni* n. sp. on *Polygonum convolvulus*, *Phytomonas plantaginis* n. sp. on *Plantago lanceolata*, *Phytomonas colurnae* n. sp. on *Corylus colurna*, *Phytomonas cichori* on *Cichorium intybus*, and *P. helianthi tuberosi* n. v. on *Helianthus tuberosus*. Technical descriptions of the pathogens are given.

[Plant disease work by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 352 (1937), pp. 38, 39*).—Progress reports are included on work with mushroom diseases, by W. S. Beach; sprays for apples, by H. W. Thurston and H. N. Worthley; the fire blight-resistant Richard Peters pear, by E. L. Nixon; timber-destroying fungi, by L. O. Overholts; and with tobacco wildfire control, by Beach.

Plant-disease investigations (*Puerto Rico Sta. Rpt. 1936, pp. 67–69, fig. 1*).—A progress report is made on the virus-induced corn stripe disease (still unknown in the continental United States) and its insect vector (*Peregrinus maidis*) and nontransmission through the seed, and descriptions are given of a plant-quarantine house and of an insect-proof house for the study of virus diseases, recently constructed by the station. A survey of sugarcane diseases indicated mosaic to be the most serious malady of this crop in Puerto Rico.

A bibliography of mycology and phytopathology of Central and South America, Mexico, and the West Indies, J. I. Otero and M. T. Cook (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *21 (1937), No. 3, pp. 4+249–486*).—This bibliography, more or less annotated, is arranged alphabetically by authors and chronologically under each author name. Most non-English titles appear first in the original language, with translations into English in parentheses.

Some suggestions on the preparation of diseased plant materials for photographing, H. H. Plagge and T. J. Maney (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 177, 178, fig. 1*).—This is a contribution from the Iowa Experiment Station.

Spray materials in relation to spray injury, H. W. Thurston, Jr. (*Penn. State Hort. Assoc. Proc., 78 (1937), pp. 72–81, figs. 6; abs. in Pennsylvania Sta. Bul. 352 (1937), pp. 40, 41*).—"The difficulty of finding a spray material for apples that will be perfectly safe and at the same time effective is indicated. Liquid lime-sulfur 1:100, fortified with either 4 lb. of catalytic sulfur or 5 lb. of Sulcoloid, is a promising combination. Among copper compounds used as cover sprays, copper phosphate with lime and bentonite is one of the least injurious and may also prove sufficiently effective on many varieties."

Sulphur and rosin as downy mildew fungicides, C. E. Yarwood (*Phytopathology, 27 (1937), No. 9, pp. 931–941, figs. 2*).—In this work by the University of California, sulfur dust, lime-sulfur, and rosin reduced the germination of onion mildew sporangia, but they were less toxic than $CuSO_4$. Sulfur dust was nontoxic or only slightly so when drops of spore suspension were added to

sulfur-dusted slides, but it was very toxic to spores on plain agar plates dusted with sulfur. The toxicity of rosin was reduced by agar.

Without spreaders, bordeaux and lime-sulfur sprays spread poorly on onions or hop foliage. Addition of Penetrol to bordeaux mixture and sodium oleyl sulfate to lime-sulfur increased their covering properties, decreased the amount of fungicide deposited on the leaves, and increased the protective action. Lime-sulfur and rosin lime-sulfur proved effective in preventing sporulation of onion- and hop-mildew organisms. Other sprays did not. Bordeaux mixture, lime-sulfur, and rosin effectively reduced downy mildew infection of onion and hop under both field and greenhouse conditions. As judged by the initial deposit on the leaves, prevention of sporulation of these mildews, protection of onions and hops from infection in the greenhouse, resistance to weathering, protection of onions from field infection, and yield of green onions in the field, rosin lime-sulfur was the most effective fungicide tested.

Serological studies of plant viruses, K. S. Chester (*Phytopathology, 27 (1937), No. 9, pp. 903–912*).—The precipitin tests reported indicate that Canada potato streak is a strain of potato aucuba mosaic; Blakeslee's Z-mosaic of *Datura* is a strain of the etch group; Price's cucumber mosaic isolates are strains of the cucumber mosaic group, although celery mosaic, lily mosaic, and Doolittle's cucumber mosaic juices failed to react with the sera for Price's isolates; and the European Y-virus of potato is serologically indistinguishable from the American potato vein-banding virus. Potato stipple streak is also of the vein-banding group, and since in the field it is usually associated with latent mosaic, it is considered to be a type of rugose mosaic. Tobacco mosaic virus propagated in root-tissue cultures and in locally necrotic lesions yielded specific virus antigen. All viruses thus far proving serologically active are grouped according to their relationship reactions. Those failing to give reactions are also listed, with a discussion of possible explanations of failures.

The field method of precipitin testing for viruses gave dependable results by unskilled workers to whom the identity of the virus materials was unknown. Various data and suggestions are given regarding the field test for laboratory use, elimination of artifact reactions, serum preservation, and applications of the field method.

Relation of water-soaked tissues to infection by Bacterium angulatum and Bact. tabacum and other organisms, J. Johnson (*Jour. Agr. Res.* [*U. S.*], *55 (1937), No. 8, pp. 599–618, figs. 14*).—In this investigation by the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry the intercellular spaces of tobacco and other plant species were water-soaked by applying water pressure to the root system or cut stems, after which they were inoculated. Normally, tobacco is very resistent to infection with *B. angulatum* [=*Phytomonas angulata*], but when the tissues are water-soaked for a sufficient time they become very susceptible to it, and no other set of environal conditions for infection brought about the "epidemic" type of this disease. A wide variety of plant species is shown to become equally susceptible to attack by *B. angulatum* and *B. tabacum* [=*P. tabaci*] when the tissues are water-soaked. Excellent necrosis was induced on tomato, alfalfa, bean, pea, hemp, rose, apple, locust, flax, marigold, and poinsettia—all normally immune to infection by these organisms. Other plant species tested were immune in the water-soaked condition.

Other parasites, such as *B. phaseoli* [=*P. phaseoli*], proved capable of causing necrosis of tomato, though not normally affecting this host. A small amount of necrotic action was also secured on water-soaked tomatoes sprayed

with *Bacillus coli.* So far as determined, water soaking by the internal pressure method does not injure the tissues, showing rather conclusively that the bacteria enter through the stomata and that cuticular or epidermal wounding by rainstorms is not fundamentally necessary for heavy field infection with either *Bacterium angulatum* or *B. tabacum*, as has been previously supposed.

Modifications in the conception of parasitism and immunity as regards definition of the terms are suggested by these results obtained with water-soaked tissues. It is also believed likely that the results may have some practical value for our present understanding of the sources of overwintering of certain plant parasites, and hence that they may modify the present theories of applying sanitary and eradication measures for disease control.

The response of plants to chemical fractions of Bacterium tumefaciens, M. LEVINE and E. CHARGAFF (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 461–472, figs. 67*).—In this study, 25 species of plants were studied and more than 1,200 single treatments were made. Application of heteroauxins to plants normally producing adventitious roots (e. g., African marigold) resulted in a concentration of root development over the treated areas. The area was swollen, but no discrete overgrowths were formed. Tomato, cosmos, and kidney bean, in addition to forming roots over the treated areas, occasionally produced small growths bearing a close histological resemblance to crown gall tissue produced by living *B. tumefaciens* [=*Phytomonas tumefaciens*]. Chemical fractions of the latter behaved differently. When stems of equal size on the same plant were treated with one of the three fractions isolated from the parasite, the phosphatide fraction seemed to produce greater reaction in the form of cell proliferations. Histological examination of sunflower stems treated with this fraction showed hyperplasias, while the fat fraction seemed to induce hypertrophies. The polysaccharide fraction induced necrosis with limited cellular proliferation, which may be a secondary, reparative process.

The authors' observations seem to indicate that the living parasites alone can induce sizable overgrowths. It appears obvious from their experiments that some species of plants, like some species of animals, fail to respond to chemical stimulation by tumor production. *Nicotiana glauca*, tomato, kidney bean, and cosmos under the experimental conditions, when treated with a variety of chemicals, produced cellular reactions showing histological structures comparable with crown gall, but limited in size and development. These growths are considered to be plant entities and, with our present knowledge, not to be directly related to animal cancer.

Some physical, chemical, and biological properties of a specific bacteriophage of Pseudomonas tumefaciens, G. C. KENT (*Phytopathology, 27 (1937), No. 9, pp. 871–902*).—In this study by the Iowa Experiment Station, proof of a phage active on *P. tumefaciens* [=*Phytomonas tumefaciens*] was obtained by culturing the phage in a modified bouillon preseeded with the bacteria and maintaining controls for the nonlysogenic nature of the culture, medium, and bacterial byproducts. Active phages were isolated from galls on tomato, sugar beet, and marguerite, and from healthy portions of galled tomatoes but not from healthy plants. The properties of a single uniform strain from tomato were tested by continuous culture for 25 mo. The phage agglutinated the bacteria preceding lysis. It had a maximum titer of 10^{-11}, was inactivated by a 10-min. exposure in a water bath at 95° C., preserved its lytic action on rapid drying at 50°–60° in vacuo, and withstood aging in vitro provided drying was prevented. On exposing phage filtrates free of bacteria to the action of chemicals the lytic action was maintained after 6 hr. in 70 percent alcohol, 1 hr. in 1/40 phenol, 1 hr. in 1/3,000 HNO_3, 1 hr. in N/64 NaOH.

and after 72 hr. in 1 percent H_2O_2. The phage was not extracted by ether, chloroform, acetone, or butyl alcohol from liquid or dried preparations, nor was it precipitated by $(NH_4)_2SO_4$, although it appeared to be precipitated by neutral lead acetate. The phage was active only on the more pathogenic strains, but gave evidence of little therapeutic value. Absorption onto the bacteria was slow, incomplete, and did not inactivate them. The earlier literature on phages active on phytopathogenic bacteria is reviewed (with 56 references).

The carbon metabolism of the crown-gall and hairy-root organisms, H. A. CONNER, A. J. RIKER, and W. H. PETERSON (*Jour. Bact., 34 (1937), No. 2, pp. 221–236, figs. 7*).—In this study by the Wisconsin Experiment Station, the amount of glucose fermented in a liquid medium by these organisms was raised by increasing the concentration of yeast infusion or by addition of 1 percent phosphates. Agar proved more satisfactory for fermentation than liquid media. The hairy root organism fermented higher concentrations of glucose more rapidly than the crown gall organism, and the former produced about tenfold as much CO_2 as the latter. Acetic and pyruvic acids were metabolic products of the hairy root organism. From 13 to 20 percent of the carbon of the fermented glucose was recovered as CO_2, cells, and gum from cultures of the crown gall organism, and about 30 percent from cultures of the other organism. From 70 to 80 percent of the sugar fermented went to form other products, some of which were isolated and partially characterized. These metabolites differed from the bacterial gum in not yielding reducing sugars on hydrolysis. The gum consisted chiefly of glucose units and small amounts of uronic acid. Qualitative tests for other hexoses gave negative results.

The physiology of Rhizoctonia solani Kühn.—V, The activity of certain enzymes of Rhizoctonia solani Kühn, H. I. EDWARDS and W. NEWTON (*Sci. Agr., 17 (1937), No. 9, pp. 544–549; Fr. abs., p. 549*).—Continuing this series (E. S. R., 75, p. 61), a number of strains not morphologically separable were differentiated by their enzyme activities. The invertase activities of three strains isolated from Reward, Ceres, and a Durum wheat proved distinct, indicating that several physiological forms may attack the same host species. On the other hand, the invertase activities of two strains from aster and potato, respectively, were similar, suggesting that strains on distinctly different species may be identical. Enzyme activity is suggested as a possible basis for the classification of physiological strains of *R. solani*.

The catalase, diastase, and invertase activities of culture filtrates were altered markedly by the nature of the nitrogen compounds in the media. Activity was high with peptone as sole source of nitrogen, and addition of nitrate and ammonium salts failed to increase it. In other media containing either gelatin, potassium nitrate, ammonium sulfate, or urea, the enzyme activity was low. It is suggested that the apparent stimulative effect of peptone may be due to its protective influence against hydrolysis of the enzymes.

Studies on bunt, or stinking smut, of wheat and its control, R. W. LEUKEL (*U. S. Dept. Agr., Tech. Bul. 582 (1937), pp. 48*).—Continuing earlier work (E. S. R., 58, pp. 43, 649), soil temperatures of 6°–15° C. from sowing to emergence proved most favorable for infection, while temperatures above 20° or below 5° were highly unfavorable to bunt development. At any given temperature there was no positive correlation of length of emergence period with percentage of bunt. Soil temperatures after emergence did not affect the percentage of infection. Excessive soil moisture tended to inhibit infection, and sandy soil was less conducive to it than clay soil. Lime application to acid sandy soil increased the percentage of bunt from inoculated seed, while

acid soil seemed to inhibit it. The percentage of infection was roughly proportional to the spore load, but was affected in each case by the date of sowing and the relative varietal susceptibility.

Of the more than 50 dust fungicides tested for bunt control over a 7-yr. period, most of them must be eliminated from consideration as practical bunt fungicides for use in the United States. Considering relative cost, availability, freedom from objectionable features, and general effectiveness, copper carbonate or basic copper sulfate of the proper degree of fineness and containing not less than 50 percent of metallic copper, and New Improved Ceresan proved to be among the most practical dust fungicides for bunt control on the market. The diluted brands of copper carbonate, if of sufficient fineness and containing not less than 18 percent of copper, are equally effective when used at about a 50-percent heavier rate of application. Other copper salts (e. g., phosphate, red oxide, oxychloride, and oxalate) also were fairly effective, but are not generally available as bunt fungicides. Dusts containing formaldehyde, paraformaldehyde, naphthalene, iodine, or sulfur as toxic ingredients were relatively ineffective. Bunt control by fungicidal dusts was governed largely not only by the factors conducive or unfavorable to bunt infection but also by the rate or thoroughness of application, by the physical condition of the dust, by the period and manner of storage after treatment with some dusts, and by certain soil conditions. The fungicidal efficiency of copper carbonate was not affected by its copper: carbon dioxide ratio, its age or exposure to air, a range of 25–50 percent in its copper content, or by the time between treating and sowing. Copper carbonate and some other dusts were more effective in unlimed sandy acid soil than when lime was applied. Relatively dry soil after sowing did not affect the fungicidal action of the dusts used, nor did saturation of the soil except when the seed contained unbroken bunt balls or when the soil was infested. Under the latter conditions seed treatment with fungicidal dusts and to some extent with copper-sulfate solution effected a better control than formaldehyde. A small percentage of unbroken bunt balls in the seed did not greatly reduce the percentage of bunt control by dust fungicides, but soil infestation reduced it considerably. The effectiveness of certain volatile dusts was increased by storing the treated seed for some time after treatment, but prolonged storage with some dusts impaired germination. Storage of seed treated with copper carbonate or a number of other copper dusts or Ceresan for 5 weeks failed to reduce their fungicidal effectiveness, and storage for 1 yr. did not impair the viability. Although the better treatments usually improved germination and controlled bunt, they failed to increase the average yields from clean seed as compared with yields from clean untreated seed. In general, there was a high correlation between the bunt percentage in the crop from untreated seed and the percentage reduction in its yield as compared with yields from seed adequately treated or from bunt-free seed. Usually the average bunt percentage was slightly greater than the percentage reduction in yield.

A bibliography of 52 references is included.

Experiments with certain copper compounds as bunt fungicides, O. A. Nelson and R. W. Leukel (*U. S. Dept. Agr. Circ. 452 (1937), pp. 8*).—"Laboratory, greenhouse, and field studies with a number of copper compounds were carried on over a period of 5 yr. to determine their relative effectiveness in controlling bunt, or stinking smut, of wheat. Basic copper sulfate, high-grade copper carbonate, copper sulfate-aniline, and possibly copper chloride-aniline, in general were found to be superior to other copper compounds from the standpoint of cost, general effectiveness in bunt control, and freedom from certain objectionable

characteristics. A proprietary dust fungicide containing 5 percent of ethyl mercuric phosphate as its active ingredient was found equal to any of the copper dusts."

The effect of high temperature on uredial development in cereal rusts, T. JOHNSON and M. NEWTON (*Canad. Jour. Res., 15 (1937), No. 9, Sect. C, pp. 425–432, figs. 2*).—"The effect of high temperatures on the development of stem rust and leaf rust on wheat seedlings and stem rust and crown rust on oats seedlings was studied in greenhouse experiments. The experimental results show that, for temperatures above the optimum for rust development, the higher the temperature the less vigorous the pustule development. Physiologic races that at ordinary temperatures produce a '4' type of infection tend to develop a '3' type or an 'x' type at higher temperatures. At still higher temperatures the infection type becomes '2' or '1,' or even merely necrotic flecks. Physiologic races of the same rust differ in their sensitiveness to temperature. In stem rust of wheat, races that had been inbred by repeated selfings for two or more generations showed greater sensitiveness to temperature than races collected in the field. Leaf rust of wheat and crown rust of oats were less tolerant of high temperatures than stem rust of wheat."

Barberries immune or highly resistant to black stem rust of cereals, L. M. AMES (*Arnold Arboretum Bul. Pop. Inform., 4. ser., 5 (1937), No. 11–13, pp. 57–72, figs. 3*).—The life history of *Puccinia graminis* and the history of barberry eradication are briefly reviewed, the immune types of deciduous and evergreen barberries included under *Berberis* and *Mahonia* are listed and discussed, and quarantine regulations are noted.

The influence of external factors on infection of oats by Ustilago avenae, G. HAHN (*Der Einfluss äusserer Faktoren auf die Infektion des Hafers durch Ustilago avenae Jensen. Diss., Hess. Ludwigs-Univ., Giessen, 1935, pp. [3]+71+[2], pls. 2, figs. 3*).—Such factors as temperature, moisture, soil type and reaction, etc., are considered.

Natural infection of grasses with Puccinia graminis, P. A. YOUNG (*Phytopathology, 27 (1937), No. 10, p. 1028*).—The susceptibility of 20 species of grasses to infection by *P. graminis* was recorded in the epidemic of wheat stem rust in 1935 at Mandan, N. Dak. One variety of *Agropyron smithii* was nearly immune, and *A. cristatum* proved to be immune.

Cylindrocarpon ehrenbergi Wr., and other species, as root parasites of alfalfa and sweet clover in Alberta, M. W. CORMACK (*Canad. Jour. Res., 15 (1937), No. 9, Sect. C, pp. 403–424, pl. 1, figs. 3*).—*C. ehrenbergi* appears to be one of the most important pathogenic fungi associated with early spring injury to roots of alfalfa and sweetclover in Alberta. It has not been previously reported on the leguminous forage crops. On roots of alfalfa and sweetclover, *C. obtusisporum* is slightly to moderately pathogenic, *C. radicicola* is very weakly so, and *C. olidum* is nonpathogenic. These species are infrequent on diseased roots of these hosts and usually associated with *C. ehrenbergi*, but *C. radicicola* has been reported as an important root parasite of other plants.

"Isolates of *C. ehrenbergi* differ in degree of pathogenicity, and there is some evidence of host specialization. They also differ markedly in morphological and cultural characteristics, which, however, do not appear to be correlated with their parasitic abilities. The temperature range for growth of *C. ehrenbergi* in pure culture is from −2° to 32° C., but different isolates do not have the same optima. Isolates with an optimum at about 19° caused the most damage in the early spring, while one which grew best at 24° proved the most virulent during summer. The optimum hydrogen-ion concentration for growth of *C. ehrenbergi*

varies with the medium employed. Growth and spore-germination studies indicate that the isoelectric point for the fungus lies at approximately pH 5.1.

"Most of the commonly grown varieties of alfalfa and sweetclover are susceptible to attack by *C. ehrenbergi*, but resistant species like *Medicago falcata* may prove valuable as plant-breeding material. Apparently cereal crops are not attacked by the pathogen, therefore they should be grown for several years in severely infested fields."

New developments in vegetable disease control, H. C. Young (*Veg. Growers Assoc. Amer. Ann. Rpt., 1936, pp. 49–55*).—This contribution from the Ohio Experiment Station briefly summarizes data on seed and soil treatments, spraying plants before transplanting, bordeaux substitutes, new and untried remedies, and diseases not controllable by seed treating or spraying.

Responses of bean and tomato to Phytomonas tumefaciens, P. tumefaciens extracts, β-indoleacetic acid, and wounding, G. K. K. Link, H. W. Wilcox, and A. D. Link (*Bot. Gaz., 98 (1937), No. 4, pp. 816–867, figs. 22*).—The differential behaviors of axes of bean, tomato, and *Bryophyllum* inoculated with *P. tumefaciens* [=*Bacterium tumefaciens*] appeared to be due to differences in growth patterns of the hosts. Much of the overgrowth may result from responses to wounds in the infection process. The bean is highly disposed following wounding to the formation of surface and internal callus and their derivatives, and the occurrence of these events at and above the wound indicates that growth substances play a role. The disposition of an organ to enact these events is conditioned by its hereditary constitution, age, presence or absence of other organs, metabolic status, and environal factors. Their enactment is influenced by experimentally introduced growth substances, which seem able to augment or substitute in part for the native growth hormones. Different concentrations and amounts of heteroauxin applied to different organs of bean and tomato under different conditions elicited almost the entire gamut of injuries and injury reactions known to the phytopathologist, including tumors. *P. tumefaciens* produced β-indoleacetic acid (heteroauxin) in dextrose-tryptophane or dextrose-tryptophane peptone media, and crude ether extracts elicited symptoms from bean and tomato similar to those induced by inoculation with *P. tumefaciens* or by treatment with heteroauxin. Differential response by the same tissue or cell to different amounts and concentrations of heteroauxin and of the crude bacterial extract and different responses of different tissues or cells to the same concentration or amount were indicated, and most of the abnormal tissues and cells were pathic in the sense that they had less adaptive capacity for unfavorable environal conditions than corresponding normal parts.

The study, in general, "indicates that biology must use the concept 'causal complex' in attempting analysis of problems in normal and abnormal, healthy and pathic morpho-, organo-, histo-, and cytogenesis. Each constituent of the causal complex is a necessary but not a sufficient cause for the event under consideration. A tentative nomenclature and classification of growth substances are proposed. Hypotheses are advanced suggesting partial explanation of legume nodules, insect galls, forms of roots of bog, muck, and mycorhizal plants, as well as beneficial effects of humus soils, in terms of auxones. Relation of infectivity and other expressions of pathogenicity are discussed."

Investigations of the market diseases of cantaloups and Honey Dew and Honey Ball melons, J. S. Wiant (*U. S. Dept. Agr., Tech. Bul. 573 (1937), pp. 48, pls. 21, figs. 16*).—Muskmelons occupy an important position among the unloads of fresh fruits and vegetables at New York City. Cantaloups and Honey Dew and Honey Ball melons (together with all mixed shipments) include 98 percent of all the muskmelons received.

The most important diseases (1931–35) were found to be *Fusarium* rot, *Rhizopus* soft rot, *Alternaria* rot, *Cladosporium* rot, *Phytophthora* rot, charcoal rot (*Rhizoctonia bataticola*), *Diplodia* rot, and pink mold rot (*Cephalothecium roseum*). The symptoms of these diseases are described and illustrated, their history and importance are discussed, and studies of the causal organisms are reported. Temperature studies of the growth of the causal organisms in culture and the development of decay on melons, or both, are discussed, and suggestions are made for the control of these diseases. The results are also presented of studies on bacterial soft rot, anthracnose rot, and blue mold rot (*Penicillium* spp.), all of which are less important than the group of diseases mentioned above. Brief mention is made of several other market diseases of minor importance, observed on the market or reported in the literature.

The studies reported are believed to be sufficiently comprehensive to indicate the types of diseases and the nature of losses that may ordinarily be expected to occur. A literature list of 57 references is included.

Sclerotium bataticola Taubenhaus, a common pathogen of red clover roots in Kentucky, L. Henson and W. D. Valleau (*Phytopathology, 27 (1937), No. 9, pp. 913–918, figs. 2*).—A sclerotium-producing fungus, isolated frequently from blackened rootlets, taproots, and crowns of red clover by the Kentucky Experiment Station, was proved by inoculations to be mildly pathogenic and capable of inducing a seedling blight and blackening of red clover roots.

Cultures from red clover were not observed to produce clamp connections, and the type of mycelial branching did not seem to warrant placing the fungus under *Rhizoctonia*. Furthermore, other workers have reported strains that produce pycnidia in culture. It is therefore suggested that the sclerotial strains of this fungus be referred to as *S. bataticola* rather than as the more commonly accepted *R. bataticola*.

Bacterial wilt of corn, F. V. Rand and L. C. Cash (*U. S. Dept. Agr., Tech. Bul. 362, rev. (1937), pp. 32, pls. 3, figs. 2*).—This revision (E. S. R., 69, p. 069) includes a summary of subsequent work on bacterial wilt of corn, dealing with the overwintering of *Aplanobacter stewarti* [=*Phytomonas stewartii*] in adults of *Chaetocnema pulicaria*; its dissemination by a corn rootworm, larva of *Diabrotica longicornis*; extensions of the host range to teosinte, Jobs-tears, etc.; the relations of increased incidence and severity and extensions in the range of the disease to high winter temperatures; and the development of resistant varieties of sweet corn, particularly the Golden Cross Bantam variety.

Carbon and oxygen requirements of the cotton root-rot organism, Phymatotrichum omnivorum, in culture, E. J. Moore (*Phytopathology, 27 (1937), No. 9, pp. 918–930*).—The utilization of a wide variety of carbon compounds, as indicated by growth and by acidification of liquid and agar media, was determined for *P. omnivorum* under variable oxygen concentrations. Its metabolic activity was closely associated with the oxygen supply to the mycelia. On agar substrates normal oxygen concentration proved optimum, and increased oxygen had no effect on agar colonies but increased the activity in liquid cultures. Decreased oxygen retarded the activity slightly on agar and markedly in liquid media. Floating colonies on liquid media approached in activity those produced on an agar surface at a given oxygen concentration. Anaerobic conditions checked the activity but did not kill the fungus.

Control of mushroom diseases and weed fungi, W. S. Beach (*Pennsylvania Sta. Bul. 351 (1937), pp. 32, figs. 6*).—These studies indicate that mushroom houses can be made sanitary by fumigation with formaldehyde (3 lb. to 1,000 cu. ft.) or burning flowers of sulfur (2 lb. to 1,000 cu. ft.), best results

being attained with tight sealing and use of an apparatus to blow the fumes inside near the floor, supplemented by drenching the floors and spraying doorways and bottom beds with a fungicide. Fungicidal spraying of all inside surfaces and structures can be substituted for fumigation, and such treatments are also suitable for packing sheds. Treatment of adjacent yards, composting ground, etc., with $CuSO_4$, mercuric chloride, or carbolic acid solutions is also advocated. Deposits of spent compost or waste mushroom fragments should be removed, and before refilling is begun all houses that may be infested with diseases or weed fungi should be emptied, cleaned, and disinfected. For killing harmful fungi in compost, heating to 130°–140° F. (avoiding higher temperatures) is necessary, and fans are usually essential to overcome differences between top and bottom beds. Other sanitary precautions are necessary to prevent carrying of spores to clean beds and are especially important for exclusion of the *Verticillium* (brown spot) and *Mycogone* (bubbles) diseases, bacterial blotch, and white plaster mold. Soil for casing should be from uncontaminated sources or sterilized. Temperatures of bearing beds should be kept within the optimum for mushrooms (55°–58°), particularly since many diseases and weed molds become serious at abnormally high temperatures. A desirable humidity is 88–90 percent, and efficient ventilation should prevent excessive air or precipitated moisture. Surplus moisture in the pinhead and button stages must dry readily if bacterial blotch and brown spot are to be checked. All good mushrooms within an initial disease area should be picked at once, all diseased ones removed, and the area sprayed with bordeaux mixture (1–1–50 or 2–2–50) or treated with copper lime dust containing 10–15 percent of monohydrated $CuSO_4$.

Control of readily disseminated weed molds, particularly white plaster mold and olive-green mold (*Chaetomium olivaceum*), depends chiefly on favorable composting of the manure. The nearer the pH is to neutral (pH 7.0) the more likely it is that the mushroom spawn will outgrow the molds. Control of heat-resistant weed molds, such as truffles, requires thorough disinfection of the composting ground and other contaminated places. Since insects are important carriers of fungus spores, their control is also indicated. Filling houses but once a year is said to be a distinct advantage because the crop can be grown entirely within a cool season when temperature and moisture conditions are easily kept at optimum. Many fungi disappear largely by drying during the months when the houses are empty, and there is less likelihood that picking will continue in infested houses while other houses are being refilled.

Detailed descriptions are given of the *Verticillium* disease and of the mildew due to *Dactylium* sp.

Cell inclusions in onion-yellow dwarf, F. P. McWhorter (*Phytopathology, 27 (1937), No. 10, pp. 1027, 1028, figs. 1*).—In this contribution by the Oregon Experiment Station, the inclusion bodies are cytologically described and illustrated.

Comparative physiology of Actinomyces in relation to potato scab, M. M. Afanasiev (*Nebraska Sta. Res. Bul. 92 (1937), pp. 63*).—Of the 25 different cultures of *Actinomyces* studied, 13 were from scabby potatoes in the State (7 proving parasitic), and the remainder (all saprophytic) were from different sources in the United States and elsewhere. Cultures A–1 and A–12 (from Union of South Africa), *A. clavifer*, *A. setonii*, *A. flavus* (subcultures A and B), *A. viridis*, *A. tricolor*, and *A. xanthostroma*, all reported by others to be parasitic, failed to induce scab. The potato scab induced by all 7 parasitic strains was of 3 types, viz, common, deep, and russet, 2 or 3 of these types often being present on single potatoes. The difference in scab exhibited by the different cultures was that of degree of pathogenicity only. Larvae of the fickle midge (*Sciara*

inconstans) were found to make the deep-scab lesions appear larger, but *A. scabies* proved capable of inducing deep-scab pits in the absence of any larval forms. One strain caused slight infection on radishes, only a trace on sugar beets, and none on sweetpotatoes. The growth and behavior of parasitic and saprophytic *Actinomyces* strains with different carbon sources were about the same, except that the former utilized sucrose and raffinose while most of the latter strains did not. Growth and behavior were also similar with different nitrogenous compounds, except that practically all parasitic and some saprophytic strains failed to grow on a medium to which 0.5 percent of urea was added. This failure proved to be due to the toxicity of the ammonia produced in the urea decomposition. Ammonia arising from various other compounds was shown to be strongly toxic to all parasitic and some saprophytic *Actinomyces* strains. Potassium bicarbonate and calcium hydroxide were more inhibitory to growth of parasitic than of saprophytic strains, and their direct toxicity inhibited the parasitic cultures more than the high degree of alkalinity developed. Urea applications to the soil inhibited scab development in proportion to the amount applied, and no scab occurred when urea (5 g to 7 lb. of soil) was used after sterilization and just prior to inoculation. Different carbon : nitrogen ratios had a pronounced effect on the amount of nutritive and aerial mycelium developed. All parasitic and some saprophytic cultures were able to produce melanin pigment on a tyrosine medium, but only when in combination with other nitrogenous compounds. Different carbon compounds in the medium had very little influence on the production of this pigment. On media with amino acids other than tyrosine, *Actinomyces* failed to develop pigments comparable to melanin.

The ability of the parasitic cultures studied to utilize sucrose and raffinose, their inhibition by ammonia, etc., and their ability to produce melanin pigment in a tyrosine medium are all stated to be of value in differentiating them from many saprophytic *Actinomyces* strains and in contributing to our understanding of their physiology and control.

Relative efficiency of randomized-block and split-plot designs of experiments concerned with damping-off data for sugar beets, E. L. LeClerg (*Phytopathology, 27 (1937), No. 9, pp. 942–945, fig. 1*).—From the results of this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Minnesota Experiment Station, it is deemed "apparent that a split-plat design is more efficient than a randomized-block arrangement for damping-off tests in the field and the greenhouse. The results also indicate that soil-borne pathogens are not uniformly distributed in the field."

A plan for the disposal of sugar beet wash water infested with Sclerotium rolfsii, M. R. Harris (*Calif. Dept. Agr. Bul., 26 (1937), No. 2, pp. 163–168, figs. 3*).—Wash water from a sugar beet factory was effectively freed of the sclerotia (and other debris) by flowing the water with an initial rate of 800 gal. per minute (in which debris traveled in the pipe a distance of 135 ft. per minute) into a roughly diamond-shaped settling pond, where it was diverted by V-shaped baffles and the material in it reduced in speed to a rate of 3.2 in. per minute. This great reduction in speed caused all the material unable to float in still water to settle out. The water then passed under two series of baffles extending 4 in. into the water which acted as barriers to all floating matter. Beyond the baffles was a weir 4 in. high placed against the bottom, which intercepted material creeping along the bottom. From this point the water converged to the opposite end of the pond, where it passed through screens which intercepted any further sclerotia passing the other barriers and emerged clear and free of sclerotia, thus preventing the dissemination of this fungus, so destructive to many plant species.

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The inactivation of the ordinary tobacco-mosaic virus by microorganisms, J. Johnson and I. A. Hoggan (*Phytopathology, 27 (1937), No. 10, pp. 1014–1027, fig. 1*).—The inactivating influence of about 45 known species of bacteria and fungi in pure culture on tobacco virus 1 in leaf tissue and in plant extract was investigated by the Wisconsin Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry. The local-lesion method of measuring the virus concentration was used. The bacteria used, as a group, were much less effective in destroying the virus in leaf tissue than were the fungi, apparently because of their lower cellulose-decomposing power. Some bacteria, especially *Aerobacter aerogenes*, inactivated the virus rapidly in plant extract, whereas others, e. g., *Bacillus radiobacter* and *Phytomonas tumefaciens*, were very poor inactivators. The fungi as a group were more uniform in inactivating power, although considerable time was required to complete the inactivation. Aeration of cultures hastened the process. Aeration of sterile virus extract by agitation under aseptic conditions increased rather than decreased the virus concentration. A small percentage of attenuation of the virus by micro-organisms was secured. No correlation was found between the efficiency of bacterial or fungus species as virus inactivators and their power to liquefy gelatin, but it is suggested that modifications in the methods and technic for determining the influence of micro-organisms on viruses may aid in verifying their true nature.

A study of ascorbic acid as an inactivating agent of tobacco mosaic virus, M. Lojkin (*Contrib. Boyce Thompson Inst., 8 (1937), No. 6, pp. 445–465, figs. 4*).—The results of this study are summarized as follows:

"Autoxidation of ascorbic acid under the influence of cupric ions is associated with a capacity to inactivate highly purified tobacco-mosaic virus in ascorbic acid-virus systems. The autoxidation of ascorbic acid which occurs in an alkaline medium or in the presence of the catalyst, hexoxidase, is not accompanied by the capacity to inactivate the virus. The inactivation of tobacco-mosaic virus in the presence of ascorbic acid undergoing reversible oxidation catalyzed by cupric ions is attributable to the formation of a specific intermediate product in the course of the autoxidation of the ascorbic acid. Neither ascorbic acid nor dehydroascorbic acid is capable of reacting directly with the virus to effect its inactivation. The inactivation of the virus by autoxidation of ascorbic acid in the presence of cupric ions is inhibited by catalase, thus indicating that the intermediate product responsible for the inactivation is a peroxide."

The bibliography contains 43 titles.

Relation of nutrition of tomato to disposition to infectivity and virulence of Fusarium lycopersici, W. S. Cook (*Bot. Gaz., 98 (1937), No. 4, pp. 647–669, figs. 7*).—Varying the nutrition of Bonnie Best (susceptible) and Marglobe (resistant) varieties by the application or nonapplication of nitrates under otherwise identical conditions, the substrate was inoculated both previously (preinoculation) and subsequently (post-inoculation) to establishment of the plants. Recovery of the fungus from the stem base was used as a criterion of infectivity and infection and macroscopically detectable symptoms as a criterion of virulence and of pathic effects in the host. The results of these tests "revealed (1) a high frequency of infection of both resistant and susceptible tomato plants under minus nitrate nutrition, (2) a low frequency of symptoms in plants under minus nitrate nutrition, (3) no wilting in the so-called resistant Marglobe under either type of nutrition, (4) seedlings of the resistant variety under either plus or minus nitrate culture readily infected and producing symptoms identical with those of the susceptible variety.

"Type of inoculation and age of the plant are important factors in infection and symptom production: (1) Preinoculation of sand led to a higher frequency of infection and symptom production. (2) Post-inoculation of sand under minus nitrate culture did not lead to the development of any plant symptoms, even in infected plants. (3) Bonnie Best variety under plus nitrate nutrition showed a high frequency of infection and of symptom production of both the chronic and the acute type, at all seasons of the year, when either preinoculation or post-inoculation was used. (4) Preinoculation practically halved the incubation period. Browning of vascular bundles of the stem alone is an inadequate criterion of infection. Even under minus nitrate nutrition, 35.4 percent of the infected plants did not manifest brown bundles at the base of the stem."

The development of a new leaf mold resistant tomato variety for greenhouse use, L. J. Alexander (*Veg. Growers Assoc. Amer. Ann. Rpt., 1936, pp. 178–182*).—Using a leafmold-immune wild species of tomato (*Lycopersicum pimpinellifolium*) which readily hybridizes with the domestic tomato, a rather extensive breeding program was initiated by the Ohio Experiment Station looking toward the development of two new resistant varieties of Globe and Marglobe types, respectively. At the time of this report the project appeared "to have reached the stage where it will only require another generation or two to sort out a true breeding resistant strain free from the hereditary break-down and which, in addition to resistance, has high yield and quality." Resistance was shown to be dominant.

Little-leaf or rosette of fruit trees, VI, VII (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 210–212, 216–221, figs. 7*).—Studies by the University of California (E. S. R., 76, p. 495) are continued.

VI. *Further experiments bearing on the cause of the disease,* D. R. Hoagland, W. H. Chandler, and P. R. Stout.—This progress report describes recent experiments concerned primarily with effects of soil treatments on corn, in which "white bud" occurred and was prevented by zinc sulfate but not by sheep, chicken, or cow manure low in zinc. Apricot and corn seedlings grown in tanks of little leaf soil between alfalfa plants established about 1 yr. were almost free of little leaf and white bud symptoms, whereas without the alfalfa they were markedly affected. In further tests, urea appeared in some way to alter the soil, removing its power to induce disease. Decomposed tomato roots in the soil allowed a second crop of corn to develop free from the disease. Light and temperature conditions were also found to influence greatly the effects on plants, either by the soil or by solutions deficient in zinc. Analyses of plants for zinc content (by a new technic described), in general, indicated that typically diseased plants are nearly always relatively low in zinc, but it is difficult from zinc analyses alone to decide between cause and effect.

Studies of the past 2 yr. are believed consistent with the view that little leaf and related diseases have zinc deficiency as the immediate cause, but at the same time there is evidence that in some, if not all, cases soil microorganisms may intervene to bring about the zinc deficiency in the plant. The possibility that direct toxic effects may also be present in the most severe forms of the disease is not excluded.

VII. *Soil microflora and little-leaf or rosette disease,* P. A. Ark.—The method of N. Cholodny and the dilution technic, used to explore the microflora of soils bearing normal v. little leaf plants, appeared to indicate that the organisms in affected orchards are predominantly bacterial, while in the healthy orchards fungi are much more in evidence. Aqueous extract of a little leaf soil proved toxic to detached apple shoots. Alcoholic and ether extracts of this soil in-

jured corn grown in a complete culture solution, and the injury was corrected by zinc applied to the solution or plant. Little leaf soils incubated with partial anaerobiosis became very toxic to corn, tomato, cotton, and peach plants, while steam sterilization destroyed the toxicity. Steam sterilization removed the injurious factor for cotton, tomato, sunflower, and corn in one test, and either formalin or ether sterilization corrected the soils in other trials. One of the three bacterial species isolated from affected soils, inoculated into Delhi soil, induced stunting and chlorosis in corn, which was corrected by increasing the zinc in the culture or by injecting zinc sulfate into the plant stem. Preliminary tests with peach seedlings grown in sand culture and walnut in Delhi soil inoculated with this organism resulted in symptoms very similar to little leaf in the field. These also were prevented by zinc applications.

Boron treatment for a physiogenic apple disease, A. B. Burrell (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 199–205*).—Evidence is presented, in this contribution from Cornell University, that drought spot, cork, rosette, and die-back in the Lake Champlain valley are only different symptoms of the same disease. Injection of dry crystals of boric acid controlled rosette and incipient die-back in young trees. Because they are parts of the same symptom complex, it is believed that drought spot and cork as here occurring will respond to boron applications. However, it does not necessarily follow that other physiogenic diseases (e. g., bitter pit) would similarly respond, since some fruit symptoms often regarded as related may in reality be of distinct origin. It appears probable that most of the apple rosette symptoms in the West differ in etiology from the rosette here discussed. Boron injury following different methods of application is discussed.

Bitter pit of Gravenstein apples.—I, The effect of environmental temperature during the growing period, R. M. Smock (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 179–186, figs. 2*).—The influence of environal temperature during the growing season on bitter pit development in the Gravenstein variety appeared to be no more than a minor or indirect one, and this factor is not considered as important as certain metabolic conditions within the tree. Growth, maturity, and sugar content of fruits were influenced by temperature treatments, but there were no significant differences in the amount of bitter pit.

It should be noted that in this study by the University of California the experimental environments included units of a single tree.

Six years' records of amount of cork spot fruit on individual d'Anjou pear trees, E. L. Overholser and W. J. Clore (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 192–198*).—Continuing these studies by the Washington Experiment Station (E. S. R., 69, p. 820), it is indicated that while there are seasonal variations, nevertheless certain trees rather uniformly tended annually to average relatively low percentages of cork spot, while in others the tendency was the reverse. With relatively large yield differences, when the crop of a tree was largest the percentage of affected fruit was lower than in the year when it was smallest for the same tree, and during the year of highest incidence the crop was lighter than during the year of lowest incidence of such fruits. The percentage of cork spot on individual trees tended to be higher in the year of greatest trunk circumference increase and largest leaf size as compared with the year of lowest trunk increase and leaf size. In fertilizer tests the trees with most vegetative vigor (receiving nitrogen) had the highest percentage of cork spot, while those with less vigor (receiving phosphorus and potassium) had the lowest percentage. Under irrigation in central Washington, the Anjou pear tree tended to make less increase in trunk circumference

and smaller leaves during the years with heaviest crops as compared with years with lightest crops. These findings, and also correlations of the trouble with rootstocks and the possible relation to boron deficiency, are fully discussed.

Some observations on internal cork disease of apples in Massachusetts, J. S. BAILEY and W. H. THIES (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 187–191, fig. 1*).—These observations from the Massachusetts Experiment Station indicate that the disease is not limited to any one soil type, but that it occurs wherever the subsoil is unfavorable to root penetration. It is partially prevented by a heavy mulch. Whatever the cause of a shallower root system, this condition seems to be a decided handicap to trees in a time of drought, and it appears reasonable to assume that a fluctuation in adequate moisture supply would prevent a normal development of the fruit.

Effect of nutritional treatments on internal cork of apples, J. R. MAGNESS, E. S. DEGMAN, L. P. BATJER, and L. O. REGEIMBAL (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 206–209, figs. 2*).—The preliminary results presented appear to indicate that boric acid crystals placed in the trunk, or larger applications made in the soil, are beneficial in reducing cork under the Shenandoah Valley conditions and support findings reported in New Zealand and British Columbia. The possible effects of zinc sulfate and fertilizer treatments are also discussed.

Apple measles, R. F. CRAWFORD (*New Mexico Sta. Bul. 251 (1937), pp. 15, figs. 3*).—Apple measles has been known in the Ozarks (Arkansas and Missouri) since 1908, and it was discovered in New Mexico during 1918 and reported as common and destructive. The disease is most important on the Jonathan variety. Diseased trees may be dwarfed and the fruit small and inferior in quality, and young trees are sometimes killed.

Fungi isolated from measled tissues are considered to be associated organisms and not the cause of the disease. Inoculation of juices from measled into healthy tissue and various types of grafting have failed to show the characteristic behavior of fungi or bacteria. Examination of carefully prepared histological preparations stained in various ways failed to reveal the presence of any organism. The disease is most important on soils having a relatively high soluble salt content or in neglected orchards. Analyses of soils from around measled trees showed a soluble salt content as high as 6,000 p. p. m. Measles was induced on Jonathan trees by growing them in soil with a soluble salt content of 4,000–6,000 p. p. m. Trees planted in soil containing 1,000–4,000 parts of NaCl per million developed pronounced measles in one season. Controls planted in soil of low soluble salt content remained healthy. Most soils in the State are alkaline, a condition which may be an important contributing factor in measles development.

Apple measles is apparently a physiological condition influenced by a high soluble salt content of the soil.

Gummosis and its prevention by pruning and wound treatment, G. H. GODFREY and W. H. FRIEND (*Tex. Farming and Citric., 13 (1937), No. 11, pp. 7, 25, figs. 2*).—This contribution on citrus gummosis is from the Texas Experiment Station.

Diseases injurious to nut trees, D. S. WELCH (*North. Nut Growers Assoc. Proc., 27 (1936), pp. 85–88*).—This general account is a contribution from Cornell University.

Foot rot of China-aster, annual stock, and Transvaal daisy caused by Phytophthora cryptogea, C. M. TOMPKINS and C. M. TUCKER (*Jour. Agr. Res. [U. S.], 55 (1937), No. 8, pp. 563–574, figs. 4*).—This joint contribution by the California and Missouri Experiment Stations reports the *Phytophthora* foot rot to be prevalent on the San Francisco peninsula and in other localities. The

principal environal factors favoring it are said to be excessive moisture, poor soil drainage, and cool weather. Infected plants wilt suddenly, and the roots and lower stem parts of China-aster and annual stock and the roots and crowns of Transvaal daisy become soft rotted. Finally, breakage of the stem or crown at or near the soil level is followed by lodging and death. Strains of the fungus from various hosts are described. Infection in the greenhouse was obtained by adding the fungus to the wet, autoclaved soil around potted plants. The average incubation period for China-aster was 10 days, for annual stock 24 days, and for Transvaal daisy 45 days. The China-aster strain proved pathogenic to cucumber seedlings, young plants of wallflower, annual stock, Transvaal daisy, Michaelmas daisy, and hybrid cineraria, and to unwounded fruits of eggplant, ripe tomato, green bell pepper, pumpkin, watermelon, and cucumber. The annual stock strain infected China-aster and Transvaal daisy, while the Transvaal daisy strain proved pathogenic to annual stock but not to China-aster. A strain of *P. drechsleri* from Transvaal daisy readily infected that host, the symptoms induced being indistinguishable from those due to *P. cryptogea*. No resistance to the disease was noted in any of the commercial varieties of China-aster tested, including strains resistant to *Fusarium* wilt.

Some fungous diseases of Clarkia elegans, E. A. Lewis (*Phytopathology, 27 (1937), No. 9, pp. 951–953*).—The following fungi were isolated and successfully inoculated: *Alternaria tenuis, Aspergillus niger, Aspergillus* sp., *A. wentii, Botrytis cinerea, Citromyces griseus, Cladosporium elegans, Fusarium* sp., *Helminthosporium* sp., *Hormodendron cladosporioides, Mucor tenuis, Mucor*, sp., *Oospora epilobii, Penicillium brevicaule, Peronospora arthuri, Pleospora herbarum, Puccinia clarkiae, Pythium debaryanum, Synchytrium fulgens*, and *Verticillium alboatrum*.

"The results of this study show that *Clarkia elegans* seedlings and mature plants are very susceptible to fungus infection. While the controlled conditions of seedling inoculations were not normal for the plant, the symptoms were consistent with reports of similar forms on other and related host plants."

A note on the canker disease of gardenias, D. J. Obee (*Kans. Acad. Sci. Trans., 39 (1936), pp. 103, 104*).—Stem-cankered gardenias from a Kansas greenhouse and the fungus isolated therefrom are compared with somewhat similar findings by Hansen and Scott in California (E. S. R., 71, p. 213). A study of cultures of the two fungi indicated that they may be distinct morphological strains if not separate species (neither strain has been specifically named). Differences in the varietal susceptibility relations of the two strains are also noted. Painting the stems with Semesan gave promise as a control measure.

A bibliography of the Dutch elm disease, M. C. Goss and C. S. Moses (*U. S. Dept. Agr., Bur. Plant Indus., 1937, pp.* [2]+*61*).—This bibliography is a revised and extended edition of one put out in February 1935, the intention having been to include all of the scientific and semiscientific and certain of the popular articles on this disease published in journals in the United States and other countries. The 678 items are listed alphabetically by authors.

Progress in the control of white pine blister rust, S. B. Fracker (*Science, 86 (1937), No. 2229, pp. 266, 267*).—This contribution summarizes the situation in the United States through 1936, at which time over 18,000,000 acres of susceptible pine forest had been given initial protection.

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Wildlife management, W. R. Van Dersal (*U. S. Dept. Agr., Soil Conserv., 3 (1937), No. 3, pp. 73–75, figs. 8*).—This is a practical contribution on soil-saving plants that provide feed and cover for birds and mammals.

Report of the Bureau of Game Conservation, J. S. HUNTER (*Calif. State Dept. Nat. Resources, Div. Fish and Game Bien. Rpt., 34 (1935–36), pp. 25–34, fig. 1*).—Game farms, the quail refuge program, predatory animal control, deer, sage hens, and antelope are reported upon.

Report of the State Game Department, E. L. LECOMPTE (*Md. Conserv. Dept. Ann. Rpt., 13 (1935), pp. 22–59, figs. 3*).—Work during the fiscal year ended September 30, 1935, for wildlife protection and propagation in Maryland is reported.

A preliminary bibliography of West Virginia biology (volume I) (*W. Va. Univ. Bul., 37. ser., No. 5–II (1936), pp. 20*).—The zoological literature, arranged systematically by orders, which includes insects, birds, etc. (pp. 9–20), follows an alphabetically arranged list of botanical literature relating to West Virginia.

The university and conservation of Wisconsin wildlife.—Science inquiry publication III, A. LEOPOLD ET AL. (*Wis. Univ. Bul., Gen. Ser., No. 1995 (1937), pp. 39, figs. 4*).—A report of the committee on wildlife conservation appointed by the president of the University of Wisconsin with a view to correlating the research programs being conducted through that institution.

A survey of the resident game and furbearers of Missouri, R. BENNITT and W. O. NAGEL (*Missouri Univ. Studies, 12 (1937), No. 2, pp. [7]+215, figs. 20*).—Following an introduction, a discussion of zoogeographic regions, and the important game, fur-bearing, and predatory species in Missouri in part 1 (pp. 1–26), game birds are dealt with in part 2 (pp. 27–74), game mammals in part 3 (pp. 75–99), fur bearers in part 4 (pp. 101–150), predators in part 5 (pp. 151–188), and administration in part 6 (pp. 189–201). A list of 39 references to the literature is included, and additional data are given in several appendixes.

Den hunting as a means of coyote control, S. P. YOUNG and H. W. DOBYNS (*U. S. Dept. Agr. Leaflet 132 (1937), pp. 8, figs. 2*).—An account is given of the habits of coyotes as relates to their control through destruction of the newly born whelps before they abandon the dens to shift for themselves. The coyotes are particularly destructive during the denning season because of the need of extra food both for themselves and their young, and a little time spent in locating dens in April, May, and June and the destruction of the whelps may save months of strenuous effort in trying to rid the range of the predators after they have reached maturity. The proper time for hunting coyote dens is from April 5 to June 15.

Recent developments in rat control in Hawaii, C. E. PEMBERTON (*Assoc. Hawaii. Sugar Technol. Rpts., 15 (1936), pp. 119–122*).—It is pointed out that a greatly revived interest in the work developed during the year, resulting in some definite advances in methods of study and attack and in the materials used in the preparation of poison baits.

Red squirrels attack Japanese larch, W. F. MCCULLOCH (*Jour. Forestry, 35 (1937), No. 7, pp. 692, 693*).—The stunting of larch, particularly Japanese larch, at the Dunbar Forest Experiment Station, Mich., caused by the cutting of branches during the winter by red squirrels, is recorded.

Distribution of the breeding birds of Ohio, L. E. HICKS (*Ohio Biol. Survey Bul. 32 (1935), pp. 125–190, pl. 1, fig. 1*).—This contribution is based upon field work during the breeding season since 1918 in each of the 88 counties of Ohio, in the course of which every township was visited. The approximate number of species definitely known to breed in the region is as follows: Ohio 181, Indiana 169, Michigan 183, western Pennsylvania 173, West Virginia 149, Kentucky 138, southern Ontario 173, and western New York 161. About 98 species are so widely distributed that they are known to breed in each one of these States.

A list of 64 references to the literature is included.

Structural modifications in the Hawaiian goose (Nesochen sandvicensis): A study in adaptive evolution, A. H. MILLER (*Calif. Univ. Pubs. Zool., 42 (1937), No. 1, pp. [3]+79, pls. 6, figs. 12*).—This contribution is accompanied by a list of 33 references to the literature cited.

[Reports of quail studies], H. L. STODDARD (*Coop. Quail Study Assoc. Ann. Rpts., 4 (1935), pp. 20; 5 (1936), pp. 23*).—Progress during the years ended May 1, 1935 and 1936, respectively (E. S. R., 73, p. 338), is reported upon, with particular attention to the control of fire, cover work, experimental and practical work with game food plants, fire ant work, disease studies, mammal studies in relation to game and wildlife, turkey studies, and red quail experiments.

The frogs and toads of eastern North Carolina, B. B. BRANDT (*Copeia, No. 4 (1936), pp. 215–223*).—Notes are presented on 23 species of frogs and toads found to occur in eastern North Carolina.

Snakes and their ways, C. H. CURRAN and C. KAUFFELD (*New York and London: Harper & Bros., 1937, pp. XVII+285, [pls. 32, figs. 6]; rev. in Copeia, No. 1 (1937), pp. 76, 77*).—A nontechnical account of snakes and their habits, presented in 16 chapters and illustrated by photographic reproductions of some 60 forms. An annotated check list of 193 forms occurring in the United States and Canada, based upon the work of Stejneger and Barbour (E. S. R., 70, p. 647) and of Blanchard (E. S. R., 56, p. 56), with additional information on their ranges, is included. The review is by L. C. Stuart.

Notes on the habits of the crayfish (Cambarus rusticus Girard) in fish ponds in Ohio, T. H. LANGLOIS (*Ohio Dept. Agr., Div. Conserv. Bul. 135 (1936), pp. 6*).—A brief account is given of the habits of the crawfish (*C. rusticus*), the burrowing habits of which cause no injury in Ohio, while certain other habits are beneficial. In addition to its value in fishponds, this crawfish thrives in lakes and streams, thus serving an important function as food for bass.

Studies on the lymnaeid snail Fossaria parva (Lea).—I, Winter habits, C. C. HOFF (*Ill. State Acad. Sci. Trans., 29 (1936), No. 2, pp. 259–262*).—A report of the winter habits of this snail in Illinois.

Notes on Stephanoprora polycestus (Dietz) from the American crow, P. BEAVER (*Ill. State Acad. Sci. Trans., 29 (1936), No. 2, pp. 247–250, figs. 4*).—Notes are given on *S. polycestus*, a nematode parasite of fish, in crows in Illinois.

The life cycle of Moniezia expansa, H. W. STUNKARD (*Science, 86 (1937), No. 2231, p. 312*).—It was discovered in the spring of 1936 that free-living mites would eat the eggs of anoplocephaline cestodes, and that the onchospheres would hatch in the intestine and migrate to the body cavity of the mite. Since that time various tyroglyphid and oribatid mites have been exposed to infection. The eggs of *M. expansa*, one of the most common of these cestode parasites of herbivorous animals and infrequently of man, were fed to mites (*Galumna* sp.), the onchospheres being recovered in large numbers from their bodies. It is pointed out that this discovery solves the problem of the life cycle among anoplocephaline cestodes.

Directions for collecting and preserving insects, J. H. MCDUNNOUGH (*Canada Dept. Agr. Pub. 520 (1936), pp. 14, figs. 6*).—A practical account.

The physiology of insect senses, C. E. ABBOTT (*Ent. Amer., n. ser., 16 (1936), No. 4, pp. 225–280*).—This contribution is presented with a list of 187 references.

The effect of winter temperatures of 1935–1936 on some of the common Illinois insects, W. P. FLINT (*Ill. State Acad. Sci. Trans., 29 (1936),*

No. 2, pp. 256–258).—Summarizing the results of examinations, the abnormally cold weather is said to have greatly reduced the San Jose scale and brought about a considerable reduction of the codling moth and a marked reduction of the oriental fruit moth. It had little or no effect in reducing the numbers of any of the other injurious insects on which it was found possible to make any definite check.

The application of sprays to expanding plant surfaces, D. E. H. FREAR and H. N. WORTHLEY (*Science, 85* (*1937*), *No. 2217, p. 610; abs. in Pennsylvania Sta. Bul. 352* (*1937*), *p. 56*).—It is concluded from measurements of the areas of apple fruits that spray applications should be made at frequent intervals during the early stages of growth if a maximum deposit of residue is desired for insect control. Later applications of spray may be made at increasingly longer intervals, due to the less rapid expansion of the fruit surface.

Effect of applying acid lead arsenate for control of Japanese beetle larvae on the germination and development of evergreen seedlings, W. E. FLEMING, F. E. BAKER, and L. KOBLITSKY (*Jour. Forestry, 35* (*1937*), *No. 7, pp. 679–688, figs. 2*).—A report is made of an investigation conducted during the years 1934 and 1935 with a view to determining the effect on different evergreens of the application of acid lead arsenate to the seedbeds to protect germinating seeds and young seedlings from attacks by the larvae of the Japanese beetle and the closely related native white grubs. The varieties studied included Douglas fir, white spruce, Engelmann spruce, blue spruce, red spruce, jack pine, slash pine, shortleaf pine, Jeffrey pine, western white pine, longleaf pine, ponderosa pine, Norway pine, northern white pine, loblolly pine, western larch, and western red cedar.

"Germination of the seeds was not significantly modified by the application of acid lead arsenate to the soil up to 1,500 lb. per acre. The application of acid lead arsenate significantly retarded the growth of most of the seedlings. With Jeffrey pine, ponderosa pine, and slash pine, 500 lb. of acid lead arsenate reduced the growth 38.7 percent, 1,000 lb. 47.3 percent, and 1,500 lb. 50.9 percent. Most of the seedlings were not only retarded in growth but showed browning of the foliage, which varied from a browning of the tips of the needles to complete discoloration.

"In pines, the amount of arsenic trioxide absorbed from the soil varied from 90 p. p. m. in the 500-lb. treatment to 144 p. p. m. in the 1,500-lb. treatment. An average of 78 percent was found in the roots and 22 percent in the tops.

"It is concluded that the application of acid lead arsenate to beds of seedling evergreens to control larvae of the Japanese beetle or the closely related native white grubs is undesirable until further investigational work has developed a method of using the material without danger to the plants."

Observations on citrus tree reaction to oil sprays, W. EBELING (*Citrus Leaves, 17* (*1936*), *No. 8, pp. 1, 2, 32, figs. 4*).—A brief discussion contributed from the California Citrus Experiment Station.

Cattle spray tests, A. E. DOTY (*Soap, 12* (*1936*), *No. 4, pp. 97, 99, 101, 103, figs. 10*).—A discussion of stock spray testing methods for kill and repellency with pyrethrum and thiocyanate sprays.

Insect pests of cover crops, J. R. WATSON (*Citrus Indus., 17* (*1936*), *No. 10, pp. 20, 21*).—A practical contribution from the Florida Experiment Station.

Relation of cover crops to citrus insects, J. R. WATSON (*Citrus Indus., 18* (*1937*), *No. 8, pp. 8, 9*).—A practical contribution from the Florida Experiment Station.

[**Contributions on orchard insects**] (*Penn. State Hort. Assoc. Proc., 78* (*1937*), *pp. 40–44, 57–62, 64–72, fig. 1*).—These contributions presented at the

1937 meeting of the State Horticultural Association of Pennsylvania are Orchard Beekeeping, by G. H. Rea (pp. 40–44); Some Important Fruit Insects of 1936, by H. E. Hodgkiss (pp. 57–62, 64); and Research Work With Apple Insects in 1936, by H. N. Worthley (pp. 64–72) (Pa. Experiment Station).

[Work on cranberry insects in New Jersey], C. S. Beckwith (*Amer. Cranberry Growers' Assoc., Proc., Ann. Mtg., 67 (1937), pp. 4, 7, 8, 9, fig. 1*).—In referring to work at the Cranberry Substation of the New Jersey Experiment Stations, mention is made of an increase in the occurrence of the blossom worm and of the occurrence of the false yellow-headed fireworm *Sparganothis sulfureana* (Clem.) and the need for a study of this pest.

Insects attacking the timber of English oak, R. C. Fisher (*Forestry, 10 (1936), No. 1, pp. 47–57, pls. 3*).—Insects attacking green timber and seasoned timber, respectively, of species of *Quercus* in England are considered.

The more important insect enemies of books and a bibliography of the literature, H. B. Weiss and R. H. Carruthers (*N. Y. Pub. Libr. Bul., 40 (1936), Nos. 9, pp. 739–752, pls. 2; 10, pp. 827–841, pl. 1; 11, pp. 985–995; 12, pp. 1049–1063*).—A practical account is given of the more important insect enemies of the library, including the booklouse, silverfish, cockroach, drug store weevil, white marked spider beetle, larder beetle, Mexican book beetle *Catorama mexicana* Cher., other beetles, the brown house moth *Borkhausenia pseudospretella* Stain., termites or white ants (*Reticulitermes flavipes* Kol. et al.), and other miscellaneous species. The control of book insects in the Tropics is discussed (pp. 827, 828). An annotated bibliography to 1935 of the insect pests of books, compiled by R. H. Carruthers and H. B. Weiss, is included (pp. 829–841, 985–995, 1049–1063).

Insect pest situation (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 85–88*).—The occurrence of insect pests of the year as influenced by the weather, the progress of control work in grasshopper, Mormon cricket, stablefly, and screwworm outbreaks and with the pink bollworm, and the appearance of a new weevil pest from South America in many fields in two counties in Florida and two adjacent counties in Alabama (an area some 35 miles long and 7 miles wide), and a small infestation in the southern part of Mississippi, are described.

[Work in entomology by the Delaware Station] (*Delaware Sta. Bul. 207 (1937), pp. 27–33*).—The work of the year reported (E. S. R., 77, p. 215) relates to the occurrence of several important insects and the black widow spider and the factors responsible for the development of one and two annual broods of the plum curculio (E. S. R., 73, p. 362), both by L. A. Stearns; biology and control of the Tabanidae of Delaware and the repellency of fly sprays, by D. MacCreary; bionomics and control of the codling moth, by Stearns, H. G. Guy, J. B. Schmitt, and P. L. Rice, and of the oriental fruit moth, by Rice and Stearns; and mosquito investigations, by MacCreary, Stearns, and F. C. Daigh.

Current work of the entomology department of the State experiment station, J. R. Watson (*Citrus Indus., 18 (1937), No. 7, pp. 3, 18, 19*).—A brief practical summary of work in entomology under way at the Florida Experiment Station.

Report of the State entomologist, C. J. Drake (*Iowa Yearbook Agr., 36 (1935), pp. 83–98, figs. 3*).—Following an account of the occurrence of grasshoppers and other important insects of the year, Observations on Screwworm [*Cochliomyia americana*] Outbreaks and Myiasis in Iowa (pp. 91–98), are reported upon by F. Andre and Drake. Very little is definitely known about *C. americana* infestation in Iowa prior to 1934, when it became a serious pest, as reported by Knipling and Tate (E. S. R., 73, p. 358). In 1935 infestations were found in 33 counties. Observations of its life cycle in a rabbit are reported.

Fifteenth biennial report of the Kansas Entomological Commission for the years 1935–1936 (*Kans. Ent. Comn. Bien. Rpt., 15 (1935–36), pp. 24*).—This report for the years 1935–36 (E. S. R., 73, p. 71) includes an account of orchard survey and control work in the northern half of Kansas by R. G. Yapp (pp. 4–7) and in the southern half of Kansas by B. Liston (pp. 9–13), an account of the results of apiary inspection being presented in tables. Lists of certified nurseries in 1936–37 in the northern half of the State by G. A. Dean and in the southern half of the State by H. B. Hungerford are included.

[Contributions on economic insects] (*N. Y. State Hort. Soc. Proc., 82 (1937), pp. 8–13, 18–28, 48–53, 196–205*).—Contributions from the New York State Experiment Station presented at the meeting held at Rochester and Kingston, N. Y., in January 1937 (E. S. R., 75, p. 808) include the following: Insect Problems in 1936, by C. R. Crosby (pp. 8–13), and New and Old Insecticides for the Control of Aphids and Scale Insects, by F. Z. Hartzell (pp. 18–27), A New Method of Peach Borer Control, by D. M. Daniel (pp. 48–52), and Controlling Insects in Eastern New York Orchards, by P. J. Chapman (pp. 196–204).

[Work in economic zoology and entomology by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 352 (1937), pp. 20, 53–56*).—The work of the year reported upon (E. S. R., 77, p. 66) relates to spray residue on fruit, by D. E. H. Frear and H. N. Worthley; control of the codling moth, by Worthley, J. E. Nicholas, and Frear; the greenhouse symphylid, tomato pinworm, and control of mushroom insects, all by C. A. Thomas; insect life of trout streams, by G. Trembly and D. C. Sprague; insect fish food of a heavily polluted Potter County stream, by Trembly and M. A. Farrell; and apple insects of 1936, by Worthley (see p. 510).

[Contributions from the Utah Station on entomology] (*Utah Acad. Sci., Arts, and Letters, Proc., 13 (1935–36), pp. 219–294, figs. 7*).—The following are contributed (E. S. R., 76, p. 214) from the Utah Experiment Station: Contribution to a Symposium on the Biology of Utah: Principal Insect Pests of Cereals, Forage, and Orchard Fruits in Utah, by C. J. Sorenson (pp. 219–223); Type of Injury Caused by *Lygus* Bugs [*L. hesperus* Knight and *L. elisus* Van D.] to Maturing Peach Fruits—Preliminary Studies, by C. J. Sorenson and F. H. Gunnell (pp. 225–227); Preliminary Studies of *Acrosternum hilaris* (Say) in Utah Orchards, by C. J. Sorenson and E. W. Anthon (pp. 229–232); Grasshopper Survey in Utah, 1935, by C. J. Sorenson and G. F. Knowlton (pp. 233–236); Some Utah Flesh Flies (pp. 237–239), Utah Tachinidae—Notes (pp. 241–244), Pipunculidae (pp. 245–247), and The Insect Fauna of Utah—From the Standpoint of an Economic Entomologist (pp. 249–262), all by G. F. Knowlton; Rose Insects, by G. F. Knowlton and C. F. Smith (pp. 263–267); Some Intermountain Leafhoppers, by G. F. Knowlton and W. M. Allen (pp. 269–276); Notes on Wood-Boring Insects, by G. F. Knowlton and T. O. Thatcher (pp. 277–281); Mosquito Studies, by G. F. Knowlton and J. A. Rowe (pp. 283–287); Strawberry Insects, by G. F. Knowlton and C. F. Smith (pp. 289–292); and Three Hemipterous Predators [*Orius tristicolor* B. White, *Anthocoris melanocerus* Reut., and *Deraeocoris brevis* Uhler] of the Potato Psyllid [*Paratrioza cockerelli* (Sulc.)], by G. F. Knowlton and M. Allen (pp. 293, 294).

Insect immigrants in Washington, R. L. Webster and L. G. Smith (*Northwest Sci., 11 (1937), No. 1, pp. 19–21*).—A brief discussion of the more important exotic insect enemies that now occur in Washington State.

[Work in entomology by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1936, pp. 30–39, 42, 43, 45–47, 72–74*).—The work of the year referred to includes the powder-post beetle *Dinoderus minutus* F., which causes damage to wood of the common bamboo (*Bambusa vulgaris*) used for furniture, and methods for

reducing its damage; the bean leafhopper *Empoasca fabalis* DeL., a limiting factor in dry bean production; the importance of bean pod borers (*Maruca testulalis* Geyer, the Caribbean pod borer, and the lima bean pod borer) in dry bean production; serious injury to dry beans by the lesser cornstalk borer; the onion thrips as a factor in onion production and means for its control; work with insecticidal plants and insecticides; the determination of rotenone in eight species; and attack of *Derris* by the larvae of *Lamprosema indicata* and *Proteides pedro* and of *Tephrosia* by *Brachyacma palpigera* and the lima bean pod borer.

The Entomological Branch, J. G. Gardiner (*Canada Min. Agr. Rpt., 1935–36, pp. 68–84*).—This is the annual report of the work of the year with economic insects and their control (E. S. R., 75, p. 374).

Sixty-sixth annual report of the Entomological Society of Ontario, 1935 (*Ent. Soc. Ontario, Ann. Rpt., 66 (1935), pp. 102, figs. 24*).—The contributions in this report (E. S. R., 74, p. 813) include the following: Preliminary Notes on the White Pine Weevil Situation in the Petawawa Forest Reserve, Ontario, by E. B. Watson (pp. 7, 8); The Function of Wood-Boring Insects in the Development of the Forest, by M. B. Dunn (pp. 8–11); Population Study of *Ips perturbatus* Eichh., by A. R. Gobeil (pp. 11–14); Notable Changes in the Oriental Fruit Moth Parasite [*Macrocentrus ancylivorus* Roh. and *Glypta rufiscutellaris* Cress.] Situation, by W. E. Van Steenburgh (pp. 15, 16); Two Parasites [*Anagrus armatus* var. *nigriventris* Gir. and *Aphelopus* near *microleucus* Perk.] of the White Apple Leafhopper (*Typhlocyba pomaria* McA.), by T. Armstrong (pp. 16–31); Shipping of Potato Beetle Parasites and Predators to France, With Notes on the Species Involved, by L. J. Briand (pp. 31–34); Mealy Bug [*Phenacoccus aceris* Sig.] Control in Nova Scotia, by N. A. Patterson (pp. 34–36); The Insect Fauna of the Raspberry Plantations of the Province of Quebec, by J. I. Beaulne (pp. 36, 37); The European Corn Borer in Ontario in 1935, by L. Caesar (pp. 38, 39); An Interesting June Beetle Habitat in Ontario, by H. F. Hudson and A. A. Wood (pp. 39–42); White Grub Surveys in Ontario During 1935, by G. H. Hammond (pp. 42–45); Observations Concerning the White Grubs in Quebec in 1935, by G. Gauthier (pp. 45–48); The Present Status of the Alfalfa Snout Beetle *Brachyrhinus ligustici* L. in New York State, by C. E. Palm (pp. 48–54); Notes on a New or Hitherto Unrecorded Pest of Sweet Clover in Ontario [*Sitona* sp.], by L. Caesar (pp. 54–56); The Bronze Cutworm (*Nephelodes emmedonia* Cram.) in the Maritime Provinces, by R. P. Gorham (pp. 56–58); The Grasshopper Campaign in Manitoba in 1935, by A. V. Mitchener (pp. 58–60); A Note on Grasshopper Outbreaks in the Counties of Renfrew and Hastings, Ontario, in 1935, by H. A. Gilbert (pp. 60–62); Effects of Some Ecological Factors on the Pea Aphis, by P. Lagloire (pp. 62, 63); Notes on Insects Found Infesting Packing Materials Entering the Port of Montreal, by H. A. U. Monro (pp. 63–66); Further Notes Regarding Honey Bees and Pollination, by C. B. Gooderham (pp. 66–68); The Walnut Husk Fly *Rhagoletis suavis* Loew in Ontario, by G. M. Stirrett (p. 69); Insect Collections From Niagara's Colored Searchlights, by R. W. Sheppard (pp. 69–75); A Note on the Bat Bedbug *Cimex pilosellus* Harr. (p. 75) and A Note Filing System for Entomological Field Laboratories (pp. 76–80), both by G. M. Stirrett; and A Summary of Insect Conditions in Canada in 1935, by C. R. Twinn (pp. 80–95).

The Sminthuridae of southern California, O. H. Edinger, Jr. (*Jour. Ent. and Zool., 29 (1937), No. 1, pp. 1–17, figs. 35*).—Ten species of the family Sminthuridae, the members of which feed upon decaying vegetable matter and fungi, have been found to occur in southern California. Eight belong to the genus *Sminthurus* and two to the genus *Papirius*. *S. quadripunctatus* is described as new.

Contributions to the biology and taxonomy of Kalotermes (Paraneotermes) simplicicornis Banks (Isoptera), S. F. LIGHT (*Calif. Univ. Pubs. Ent., 6 (1937), No. 16. pp. [5]+423–463, figs. 8*).—This is a report of a study made of the desert damp-wood termite *K. simplicicornis*, presented with a list of 18 references to the literature.

The effects of exposure to low temperature on the developmental time of embryos of the grasshopper Melanoplus differentialis (Orthoptera), H. C. BURDICK (*Physiol. Zool., 10 (1937), No. 2. pp. 156–170. figs. 6*).—The eggs of the differential grasshopper were found to show marked variations in duration of diapause when kept at 28° C. "These variations are not random. Their nature suggests that they are determined by some as yet unknown environmental or physiological factors acting before the eggs are laid. Eggs exposed to 15° immediately after laying will develop to a stage just before blastokinesis, but have never been observed to go beyond this. The responses shown by these eggs after exposures to low temperatures fall into three categories: (1) The eggs hatch before controls, (2) the eggs hatch at the same time as controls, and (3) the eggs hatch after controls. The response obtained depends upon four factors. These are (1) potential diapause of the eggs, (2) amount of incubation when subjected to low temperature, (3) low temperature to which they are exposed, and (4) the duration of the exposure to low temperature.

"Similarities between the results obtained in the present investigation and those obtained by Townsend [E. S. R., 59, p. 157] with codling moth larvae after exposure to low temperature are pointed out."

A list is given of 23 references to the literature cited.

Locust borer and drought, F. C. CRAIGHEAD (*Jour. Forestry, 35 (1937), No. 8, pp. 792, 793*).—Observations indicate that lack of moisture may be one of the most important factors predisposing the locust to locust borer injury.

How to control grasshoppers in Oklahoma, F. A. FENTON (*Oklahoma Sta. Bul. 233 (1937), pp. 12, figs. 6*).—A practical account is given of protective and control measures for grasshoppers in Oklahoma. An account of the species of particular importance in that State has been noted (E. S. R., 78, p. 366).

The gladiolus thrips situation in western Washington during 1935, R. LATTA (*West. Wash. Hort. Assoc. Proc., 26 (1935), pp. 8, 9*).—The gladiolus thrips, first found in Washington State in the fall of 1933 in three plantings in the Puget Sound area, is said to have become widespread through the State the following year. Mention is made of several cases where fields of gladiolus were heavily infested by the summer migration in August, the later varieties being a total loss.

The present status of the Douglas fir woolly aphis Adelges cooleyi Gillette in Britain, A. E. CAMERON (*Forestry, 10 (1936), No. 2. pp. 133–142, pls. 2, figs. 2*).—Observations of *A. cooleyi*, galls of which were first found in Great Britain on the primary host, Sitka spruce, in 1935, are reported. It is considered probable that they had become established 3 or 4 yr. before.

The production of intermediate-winged aphids, with special reference to the problem of embryonic determination, A. F. SHULL (*Biol. Bul., 72 (1937), No. 3, pp. 259–286, figs. 2*).—Extensive experiments, in which the environmental agents known or believed to modify the aphid cycle were combined in a variety of ways and studies carried out over a period of years, are reported. The experiments described, in which two independent strains of the potato aphid were employed, involved a total of 530,133 aphids, of which 9,152 were intermediate winged.

Pea aphis control, H. GLASGOW (*Canning Trade, 59 (1937), No. 38, p. 16*).—A practical contribution from the New York State Experiment Station.

Atlas of the scale insects of North America, G. F. FERRIS (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, 1937, [ser. 1], pp. 8+[272], [pls. 104]*).—This work, described by the author as essentially a collection of plates of illustrations with textual material reduced to the barest minimum sufficient for necessary explanation, is intended primarily as a means for the identification of species. Following a general introduction, the first series, here presented, takes up 34 genera of the subfamily Diaspidinae, of which 7 are newly erected, and 101 species, of which 10 are described as new. Only species definitely established within the boundaries of North America, the adjacent islands, and the Greater Antilles are considered, no species being included merely on the basis of quarantine records. The account of each species includes its synonyms, hosts and distribution, habit, recognition characters, and notes.

Morphological differences distinguishing California red scale, yellow scale, and related species (Homoptera—Diaspididae), H. L. MCKENZIE (*Calif. Univ. Pubs. Ent., 6 (1937), No. 13, pp. 323–335, pl. 1, figs. 4*).—In the present study conducted by the California Citrus Experiment Station, it was found that the California red scale and the yellow scale *Aonidiella citrina* (Coq.) may be separated on the bases of morphological characters as represented in the pygidium. "These characters consist of sclerotized structures A and B on the ventral part of the pygidium and the fourth lobelike process laterad of the last three plates on the pygidial fringe. *A. taxus* Leon. is the species found on *Podocarpus* spp. in Asia and on *Taxus baccata* in Italy. *A. orientalis* (Newst.) is apparently a very common species throughout Asia. *A. comperei* on citrus in Bombay, India, is described as a new species. Parasite emergence holes, as well as an occasional parasite itself, are to be seen in what appears to be typical red scale (*A. aurantii* (Mask.)) from China, India, and Africa."

Gustation and olfaction in lepidopterous larvae, V. G. DETHIER (*Biol. Bul., 72 (1937), No. 1, pp. 7–23, figs. 4*).—The author presents data on the gustatory thresholds for sucrose, dextrose, and hydrochloric acid and on the olfactory threshold for ethyl alcohol; locates and describes the sense organs involved; and shows what part these two senses play in the selection of food plants. Gypsy moth caterpillars were used as suitable test subjects for the determination of the taste threshold of various substances.

Developments in the spray program for codling moth control, W. S. HOUGH (*Va. State. Hort. Soc. Rpt., 41 (1936), pp. 240–243; also in Mountaineer Grower, 8 (1937), No. 83, pp. 9–11*).—This practical contribution from the Virginia Experiment Station, presented to the Virginia and West Virginia horticultural societies in December 1936 and February 1937, respectively, reports progress made in the spray program for codling moth control, including information obtained in the use of certain insecticides. It is pointed out that spraying is only one of the avenues of approach in better control of this pest.

The spring emergence of the codling moth, G. A. BIEBERDORF (*Okla. Acad. Sci. Proc. [Okla. Univ.], 16 (1936), pp. 33–35*).—A report of observations of the earliest spring emergence of the adult codling moth made at Stillwater since 1924. The details of the daily emergence in 1935 are given in tabular form.

The codling moth problem in Maryland, C. GRAHAM (*Md. Fruit Grower, 6 (1936), No. 11, pp. 1, 2*).—A brief discussion of the codling moth situation in Maryland at the close of 1936 as related to its occurrence in 1937.

The genotypes of the North American Hadeninae (Lepidoptera, Noctuidae), H. M. TIETZ (*Jour. N. Y. Ent. Soc., 45 (1937), Nos. 1, pp. 61–107; 2, pp. 211–249, figs. 276; abs. in Pennsylvania Sta. Bul. 352 (1937), p. 56*).—In this

contribution the genotypes of some 70 genera of the noctuid subfamily Hadeninae are discussed and figured, with special emphasis on their structure rather than their coloration and marking.

Annual report of the Essex County Mosquito Extermination Commission, November 1st, 1935, to October 31st, 1936 (*Essex Co.* [*N. J.*] *Mosquito Extermin. Comn. Rpt., 1936, pp. 17, pls. 2, figs. 2*).—The annual report of the extermination work of the year, night collections of adult mosquitoes and special collection of mosquitoes being given in table form.

How to control the walnut husk fly in 1937: Promising program provided, A. M. Boyce (*Diamond Walnut News, 19* (*1937*), *No. 4, pp. 8, 9*).—A practical contribution on the control program for the walnut husk fly in 1937 from the California Citrus Experiment Station. The infestations of this pest in 1936 were the most severe of any season during its history in California, and very large populations of the flies were expected in 1937.

New muscoid flies (Diptera) in the United States National Museum, D. G. Hall (*U. S. Natl. Mus. Proc., 84* (*1937*), *No. 3011, pp. 201–216, figs. 8*).—Among the 10 species here described as new are *Hylemya abdena*, of which the carnation serves as a host plant at Portland, Oreg.; *Zenillia* (*Sisyropa*) *nox*, a parasite of the larch sawfly in Hokkaido, Japan; *Myocera tabanivora*, a parasite of a tabanid larva from Ramsey Co., Minn.; and *Phaonia pudoa*, a parasite of the mountain pine beetle at Coeur d'Alene, Idaho.

Notes on hippoboscid flies, C. M. Herman (*Bird-Banding, 8* (*1937*), *No. 4, pp. 161–166*).—This contribution consists mainly of a list of the hosts which have been found infested by hippoboscid flies at the Austin Ornithological Research Station on Cape Cod, Mass. Notes on their relative abundance on different species of birds and the role they may play in the spread of parasites among the avifauna are included.

The Japanese beetle, R. W. Leiby (*N. C. Dept. Agr. Bul., 1936, Sept., pp. 10, figs. 8*).—A practical account of the life history and habits of the Japanese beetle, first found in North Carolina in 1932 when beetles were captured in traps placed in Durham, Raleigh, and Winston-Salem. In 1933 a total of 31 beetles were trapped in 15 cities and towns. No trapping was carried on in 1934, but in 1935 219 beetles were trapped in 16 cities and towns of the State, and during June and July 1936 145 in 15 cities and towns.

The effect of different relative humidities on survival and metamorphosis of the Japanese beetle (Popillia japonica Newman), D. Ludwig and H. M. Landsman (*Physiol. Zool., 10* (*1937*), *No. 2, pp. 171–179, figs. 4*).—The loss in weight and water of third instar larvae, prepupae, and pupae of the Japanese beetle was found to be inversely proportional to the relative humidity of the environment. "The time of survival of third instar larvae is greater at higher humidities. In the case of prepupae and pupae many individuals metamorphosed at the higher humidities, and therefore the time of survival (which includes the duration of the prepupal or pupal stages in the metamorphosing individuals) is reduced. Loss in weight is due to water loss; hence, there is no conservation of metabolic water in the three stages studied. Death occurred at approximately the same water content regardless of the rate of desiccation. An almost saturated medium is necessary for the metamorphosis of prepupae and pupae, whereas third instar larvae are unable to metamorphose at any humidity when starved."

The plum curculio, M. L. Bobb (*Va. Fruit, 25* (*1937*), *No. 4, pp. 16, 18, 20, 21*).—A practical contribution from the Virginia Experiment Station.

The bionomics of entomophagous Coleoptera, W. V. Balduf (*St. Louis, Mo.: John S. Swift Co., 1935, pp. [1]+220, figs. 108*).—The subject matter (pp.

1-167) and the literature cited (pp. 168-185) are arranged under the 13 families of Coleoptera considered, the remaining material being presented under the heading of the smaller and less known families. A subject-matter index is included.

Report of the State apiarist for the year ending December 31, 1935 (*Iowa State Apiarist Rpt., 1935, pp. 87, figs. 14*).—Included in this report of the State apiarist, F. B. Paddock, is a report of the proceedings of the twenty-fourth annual convention of the Iowa Beekeepers' Association held in November 1935, which includes the Results of 1935 Disease Resistance Program, by O. W. Park (pp. 49-57), contributed from the Iowa Experiment Station.

In the resistance work 31 colonies were inoculated. American foulbrood became well established in all 6 of the check colonies and in several of those supposed to be resistant. Of 25 supposedly resistant colonies tested, 7 were found apparently free from disease on September 28. Of these 7, all but 1 are known to have developed more or less American foulbrood following inoculation.

The mutillid wasps of the genus Timulla which occur in North America north of Mexico, C. E. Mickel (*Ent. Amer., n. ser., 17 (1937), Nos. 1, pp. 56, figs. 8; 2, pp. 57-119, figs. 25*).—This synopsis, contributed from the Minnesota Experiment Station, includes a key to the species of the genus *Timulla*, both males and females, and descriptions of 24 new forms occurring in the United States and Canada.

Phylogeny of some eurytomid genera, R. E. Bugbee (*Ent. Amer., n. ser., 16 (1936), No. 3, pp. 169-223, figs. 61*).—This contribution on the family Eurytomidae of the Chalcidoidea is presented with a list of 45 references to the literature.

The Illinois species of Brachymeria (Hymenoptera, Chalcididae), B. D. Burks (*Ill. State Acad. Sci. Trans., 29 (1937), No. 2, pp. 251-254, figs. 14*).—A key for their separation and accounts are given of five Illinois species of the genus *Brachymeria*, which include a number of primary and secondary parasites of Lepidoptera and cyclorrhaphous Diptera.

Studies on the biology of Coccophagus (Hymenoptera), a genus parasitic on nondiaspidine Coccidae, S. M. Cendaña (*Calif. Univ. Pubs. Ent., 6 (1937), No. 14, pp. [6]+337-399, figs. 48*).—Studies made of the biology of species of *Coccophagus*, of which to date 133 have been recognized throughout the world (all, so far as known, primary parasites of nondiaspidine Coccidae, including mealybugs), are contributed from the California Citrus Experiment Station. Included are *C. gurneyi* Comp., *C. ochraceus* How., *C. trifasciatus* Comp., *C. scutellaris* (Dalman), and, to a less extent, *C. capensis* Comp., all of which, except *C. ochraceus*, lay their eggs in the coelomic cavity of the host. *C. ochraceus* deposits its eggs on the ventral surface of the host.

"Three larval instars were definitely ascertained in all the species except *C. capensis*, in which the number of instars was not definitely determined. The larval instars differ in the size of the head case, the degree of development of the respiratory system, the number of body segments, and certain other features. All the species are internal parasites except *C. ochraceus*, which is an external feeder during the first two larval instars but later enters the viscera of the host. Two groups may be recognized with regard to their host relations. *C. gurneyi* and *C. ochraceus* consume all the internal organs and pupate in the empty shell of their host. They cast the last larval skin before pupation. *C. trifasciatus*, *C. scutellaris*, and *C. capensis* avoid injury to the vital organs of the host, pupate before the host dies, and retain their last larval skin as a pupal shroud. Superparasitism occurs in all the species studied. In *C. ochraceus* the surplus larvae are eliminated by active competi-

tion for the possession of the host. In the other species, phagocytosis seems to be the chief eliminating factor. . . . Inhibited hatching is here first described. It results from failure of the female parasite to mate before oviposition. The phenomenon is found in *C. gurneyi* and *C. trifasciatus*."

C. gurneyi, an Australian species, is a parasite of the citrophilus mealybug, for which it has provided a very successful control in California, and develops with a fair degree of success in the long-tailed mealybug and rarely in the Mexican mealybug. *C. ochraceus* parasitizes young black scales and hemispherical scales. *C. trifasciatus*, an African species, parasitizes young black scales. *C. scutellaris* is a parasite of several species of lecaniine scales, on the soft scale the eggs being deposited in the scale. *C. capensis* is a parasite of the late third instar black scale and *S. nigra* (Niet.).

A list is given of 19 references to the literature cited.

Ovipositional instincts and developmental sex differences in the genus Coccophagus S. E. FLANDERS (*Calif. Univ. Pubs. Ent., 6 (1937), No. 15, pp. 401–422, figs. 7*).—This report of experimental studies conducted at the California Citrus Experiment Station on the reproduction of a species of *Coccophagus* introduced into California from South America reveals the existence of a remarkable phenomenon of bisexual development, the females developing only as primary endoparasites and the males only as secondary parasites, either ectoparasitically or endoparasitically. A reference to this has been noted (E. S. R., 76, pp. 833, 834). "This phenomenon was found to characterize several species of *Coccophagus*. The developmental history of the female of one species is very similar to that of the others. The developmental histories of the male, however, may differ radically. The types of parasitism represented by the male are indirect secondary ectoparasitism, direct secondary endoparasitism, and direct secondary ectoparasitism.

"The *C. gurneyi* male is an indirect secondary parasite of various species of mealybugs. The first instar is a planidium. The *C. trifasciatus* male is an indirect secondary parasite of black scale. The first instar is a modified planidium. The *C. scutellaris* male is a direct secondary endoparasite of lecaniine scales. The first instar is a teleaform larva. The *C. capensis* male is a direct secondary endoparasite of *Saissetia* spp. The first instar is a teleaform larva. The *C. lycimnia* male is a direct secondary ectoparasite of various lecaniine scales and of mealybugs. The first instar is a larva of the common hymenopterous type.

"In the species having males that are direct secondary parasites, the instincts of the sexually mature female before mating are those of a secondary parasite, after mating those of a primary parasite. Unmated females produce only male progeny, mated females only female progeny. The life cycle of the male is equal to the minimum life cycle of the female. Knowledge of this phenomenon increases the possibility of successful use of aphelinids in biological control."

The Nearctic sawflies of the genus Fenusa (Hymenoptera, Tenthredinidae), H. H. Ross (*Ill. State Acad. Sci. Trans., 29 (1936), No. 2, pp. 263–266, figs. 19*).—This contribution includes a key to the Nearctic forms, accompanied by an account of seven species of sawflies of the genus *Fenusa*, including *F. lucifex* n. sp. from Illinois. The sawflies of this genus are leaf miners so far as known, including *F. ulmi* Sundewall on elm, *F. pusilla* (*pumila*) on birch, and the European alder leaf miner and perhaps *F. inspiratus* (MacGilliv.) on alder.

A study of the bulb mite (Rhizoglyphus hyacinthi Banks), P. Garman (*Connecticut [New Haven] Sta. Bul. 402 (1937), pp. 885–904, pls. 3, figs. 3*).—This is a revision of Bulletin 225 (E. S. R., 44, p. 857).

Early and late injury of rust mites on oranges, W. L. Thompson (*Citrus Indus., 18 (1937), No. 7, pp. 5, 9, 20, 21*).—A practical contribution from the Florida Citrus Substation on the citrus rust mite.

Control measures for rust mites, J. R. Watson (*Citrus Indus., 18 (1937), No. 6, pp. 17, 18*).—A practical contribution from the Florida Experiment Station on the citrus rust mite.

ANIMAL PRODUCTION

[Livestock investigations in Delaware] (*Delaware Sta. Bul. 207 (1937), pp. 21–26*).—Progress is reported on studies of dried distillers' and dried brewers' grains for growing fattening pigs, forage crops for swine, the selection of males in breeding for high egg production and viability in poultry, and broiler production, all by A. E. Tomhave; and the protein levels of rations for growing chicks and the value of germinated oats in the ration of laying pullets and breeding hens, both by Tomhave and C. W. Mumford.

[Livestock investigations in Pennsylvania] (*Pennsylvania Sta. Bul. 352 (1937), pp. 21, 33–35, 37, 51–53, fig. 1*).—Brief results are presented on studies of the relative efficiency of gains in good, medium, and common feeder steers, by F. L. Bentley and P. T. Ziegler; hothouse lamb production and the relative gains of shorn and unshorn feeder lambs, both by W. L. Henning and T. B. Keith; soybean oil meal for lambs, by Keith; the calcium and phosphorus content of the serum of lambs affected with "stiff lamb disease," by A. K. Anderson; the protein requirements of fattening pigs and alfalfa as a forage crop for swine, both by Keith and M. A. McCarty; methods of curing pork, by Zeigler and R. C. Miller; mineral deficiencies in pasture grasses, by E. B. Forbes and S. R. Johnson; the dynamic effects of individual nutrients, by Forbes and L. Voris; and allantoin analyses in cow urine, by Anderson.

Poultry investigations yielded information on nutritive deficiency diseases in poultry, by R. A. Dutcher and H. C. Knandel; the nutrition of ring-necked pheasants, by E. W. Callenbach and R. R. Murphy; the nutrition of turkeys, by Knandel, J. E. Hunter, and D. R. Marble; mortality in the poultry flock, by Marble; skim milk for fowls, by Knandel; and factors affecting quality in eggs, by Marble, Knandel, and W. J. Rudy.

[Animal production and poultry studies in the Southern States] (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 80–93, 135–140, 210–221, 290–303*).—The following papers were presented before the animal production and poultry divisions at the thirty-seventh annual convention of the Association of Southern Agricultural Workers held at Jackson, Miss., February 5–7, 1936 (E. S. R., 75, p. 528): Vitamin A in a Wintering Ration for Beef Cattle, by H. Schmidt (p. 80); Steer Gains on Sudan Pasture With and Without Cottonseed Cake, by J. H. Jones (p. 81); Cottonseed Meal as a Supplement to Pasture for Young Beef Stock, by F. R. Edwards (pp. 81, 82); Experimental Results on the Value of Supplemental Feeds for Early Spring Lambs Finished on Grass, by M. Jacob and L. R. Neel (p. 82); Grazing and Parasitical Studies With Cattle and Sheep, by M. G. Shell and R. L. Mayhew (pp. 82–84); Observations on Chilling and Curing Lamb, by J. A. Beall and D. L. Purdy (pp. 84, 85); Experimental Results on the Value of Supplemental Feeds in Finishing Two-Year Old Steers on Grass, by M. Jacob, H. R. Duncan, and L. R. Neel (pp. 85, 86); Pasture and Workstock Problems, by R. H. Means (pp. 86, 87); Chufas as a Feed for Hogs, by W. W. Henley (pp. 88, 89); Comparison of Grazing Crops for Fattening

Swine, by Z. A. Massey (pp. 89–91); Blackstrap Molasses—A Poor Feed for Hogs, by H. P. Gayden (p. 91); Winter Pasture in Pork Production, by H. L. Leveck (pp. 91, 92); Utilization of Feed by Inbred and Outbred Pigs, by W. A. Craft (pp. 92, 93); Further Observations on Blindness and Paralysis at the Louisiana Agricultural Experiment Station, by B. A. Tower (pp. 137, 138); A Sack-Cement Poultry House, by D. F. King (pp. 138, 139); Protein Supplement as a Basis for Feeding Program, by G. R. Sipe (pp. 139, 140); and Blackstrap Molasses and Sweet Potatoes in Finishing Rations for Broilers, by C. W. Upp (p. 140).

The following papers were presented before the thirty-eighth convention held at Nashville, Tenn., February 3–5, 1937: Problems in Breeding Farm Work Stock, by W. W. Dimock (pp. 210, 211); To What Extent Should Cottonseed Meal be Used in Rations for Fattening Steers, by W. L. Blizzard (pp. 211–213); Grain-Feeding Steers on Grass, by H. R. Duncan (pp. 213, 214); Summary of Three Years' Work on the Influence of Concentrates in Rations for Calves Run on Winter, Spring, and Summer Pasture, by M. Jacob and B. P. Hazlewood (p. 214); Mineral Requirements for Farm Animals, by R. B. Becker (p. 215); Sweet Potatoes for Fattening Hogs, by F. R. Edwards (pp. 215, 216); Grazing Crops for Hogs, by B. L. Southwell (pp. 216, 217); The Most Profitable Southern Ration for Hogs, by F. Hale (pp. 218, 219); Preservation of Farm Dressed Meat, by K. F. Warner (pp. 219, 220); Worm Control in Sheep, by Z. A. Massey (pp. 220, 221); The Value of a Poultry Record Program, by C. F. Parrish (pp. 293, 294); Practical Aspects of the Fowl Paralysis and Leukemia Problem in Chickens, by M. W. Emmel (p. 295); Poultry Mortality, by R. S. Dearstyne (pp. 295, 296); A Breeding Program to Reduce Adult Mortality in Poultry, by C. D. Gordon (pp. 296, 297); Minerals in the Poultry Ration, by C. L. Morgan (p. 299); The Influence of Green Feeds on the Storage Quality of Eggs, by R. M. Smith (pp. 300, 301); and Potential Possibility of Laying Cages in the Poultry Industry, by G. R. Sipe (p. 302).

[Animal husbandry experiments in Northern Ireland] (*Agr. Res. Inst. North. Ireland, Ann. Rpt., 9 (1936), pp. 23–28, 30–33, 38, 39*).—This report presents information on the relative efficiency of two methods for wintering bullocks, and the desirability of crossing Border Leicester and Suffolk rams with black-faced and cross-bred ewes for the production of market lambs, both by J. Morrison; the effects of soybean meal and fish meal supplements in the growing ration of pigs; the effects of various levels of protein and various combinations of cereals in a chick-growing ration, the value of potatoes in a laying ration, a comparison of whole v. cracked corn in a scratch ration, and the effect of adding 0.5 percent of Epsom salts to the laying mash, all by J. H. Prentice; and the significance of the serum phosphatase picture in poultry nutrition.

The effects of deficiency of phosphorus on the utilization of food energy and protein, E. B. Forbes (*Jour. Nutr., 14 (1937), No. 4, pp. 419–433*).—Employing the same method of attack as previously reported (E. S. R., 72, p. 371), the Pennsylvania Institute of Animal Nutrition has determined the effect of a phosphorus deficiency on the growing rat in two 70-day body balance and metabolism experiments with paired feed control. The phosphorus-deficient and phosphorus-supplemented diets in the first experiment contained 0.137 and 0.366 percent of phosphorus, respectively, and in the second experiment 0.133 and 0.653 percent.

In the first experiment the increased phosphorus intake of the supplemented group over the 70-day period resulted in a 15 percent greater phosphorus content in the animal body, but did not cause any difference in growth or in the utilization of food energy or protein. In the second trial the phosphorus-supplemented

diet resulted in an 18 percent greater phosphorus content in the rat body. It produced a slight but statistically significant decrease in the digestibility of food protein, but no other effect on growth or the utilization of food energy intake or protein. In each instance the phosphorus content of the deficient rations was considered the minimum which would permit normal growth.

The utilization of energy producing nutriment and protein as affected by deficiency of iron and copper, A. Black, O. J. Kahlenberg, J. W. Bratzler, and E. B. Forbes (*Jour. Nutr., 14 (1937), No. 5, pp. 521–533*).—In a similar type of experiment as noted above, a diet of whole milk powder deficient in iron and copper was compared with the same diet supplemented with iron and copper salts in a 6-week growth, metabolism, and body balance experiment with young albino rats. The rate of feeding was controlled by the paired method.

Rats on the unsupplemented diet promptly developed typical cases of nutritional anemia as indicated by hemoglobin determinations at the end of the second, third, and sixth week of the experiment. This group had a smaller food consumption, digested more of the energy and nitrogen of the ration, produced more heat, and stored more water than rats on the supplemented diet, but the latter group made greater gains in body weight, stored more energy, and gained more in fat and nitrogen. When killed at the end of the test, the skins of the anemic rats were colorless, the hair was chalk-white, the eyes extremely pale, and the heart, spleen, and kidneys were generally enlarged.

A further contribution to the derivation of factors for computing the gaseous exchange and the heat production in the metabolism of proteins, M. Kriss and L. Voris (*Jour. Nutr., 14 (1937), No. 2, pp. 215–227*).—Continuing this study (E. S. R., 74, p. 80), balances of nitrogen, carbon, and energy have been determined with rats receiving first a mixed basal maintenance diet and then the same diet supplemented with each of three different proteins, namely, heart muscle, casein, and gelatin at the rate of 1.5 and 3 g each. By a comparison of the basal diets and the supplemented diets it was determined that 86.61 percent of heart muscle, 82.14 percent of casein, and 81.06 percent of gelatin were metabolized. The following factors were determined for computing the respiratory exchange and the heat production in the metabolism of the different proteins: 1 g of urinary nitrogen equals 5.96, 6.76, and 5.05 l of respiratory O_2; 4.75, 5.58, and 4.22 l of CO_2; and 26.71, 31.15, and 23.44 calories for heart muscle, casein, and gelatin, respectively.

The uronic acid content of the nitrogen-free extract of feeding stuffs, G. A. Guanzon and W. M. Sandstrom (*Jour. Agr. Res. [U. S.], 55 (1937), No. 8, pp. 581–586*).—The authors, working at the Minnesota Experiment Station, have determined the uronic acid content of nine feeds representative of concentrates, grain byproducts, and roughage groups and have indicated the relationship of uronic acid to the sugars and starch, the pentosans, and the residual nitrogen-free extract in the total nitrogen-free extract of these products.

Roughages in general contained a higher percentage of the uronic acid anhydrides than did the concentrates, but it was not possible to establish a regular relationship between this compound and the other constituents of the nitrogen-free extract. A calculated artificial coefficient of digestibility of these feeds based on the sugars and starch, the soluble pentosans, and the soluble residual nitrogen-free extract was shown to agree quite well with the results of digestion trials. However, the parallelism was less close in the case of roughages which contained a greater amount of the uronic acid.

The role of manganese and certain other trace elements in the prevention of perosis, H. S. Wilgus, Jr., L. C. Norris, and G. F. Heuser (*Jour. Nutr., 14 (1937), No. 2, pp. 155–167*).—This is a report of a further study (E. S. R.,

78, p. 91) on the identity of the material present in a commercial monocalcium phosphate which exerted a perosis-preventive action. The essential conclusions have been noted (E. S. R., 76, p. 678). A mixture of manganese, aluminum, and iron was entirely perosis-preventive in the presence of limited amounts of calcium and phosphorus. The calcium, phosphorus, and manganese content of a number of feeding stuffs is indicated, with evidence that the perosis-preventing properties of certain cereal products are related to their manganese content.

Symptomatology of vitamin-A deficiency in domestic animals, G. H. Hart and H. R. Guilbert (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 193–200, fig. 1*).—Eye lesions including night blindness and optic nerve degeneration, various alterations within the nervous system and in the peripheral nerves, and numerous types of lesions involving various epithelial structures of the body arising from vitamin A deficiencies in the animal diet are described in considerable detail in this report from the California Experiment Station.

Pigments associated with the fatty tissues of plants and animals, I. M. Heilbron and A. E. Gillam (*Nature [London], 139 (1937), Nos. 3519, pp. 612–615; 3520, pp. 657–660, figs. 2*).—This is a review of the chemical properties of the carotenoid pigments and their physiological importance in the economy of life.

[Analyses of native feeding stuffs in Puerto Rico] (*Puerto Rico Sta. Rpt. 1936, pp. 22, 87–89*).—Data are presented on the dry matter, crude protein, fat, ash, sugar, fiber, and total carbohydrate content of the leaves of the leguminous trees *Erythrina poeppigiana* and *E. berteroana* and of the leaves and stems of the weed *Commelina elegans,* also on the dry matter and crude fat content of the seeds of the royal palm (*Roystonea regia*) at different stages of maturity. Each of these products is considered potentially an important feeding stuff. Sugarcane, with its juices containing 10–16 percent of sucrose, proved to be a very palatable source of high carbohydrate feed for dairy animals.

Commercial feeding stuffs from September 1, 1936, to August 31, 1937, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 555 (1937), pp. 195*).—This is the usual report (E. S. R., 76, p. 837) of the results of chemical analyses and microscopic examination of 3,555 samples of feeding stuffs. The results of the bio-assay of 16 vitamin D supplements and tests for hardness on 17 samples of cottonseed cake are also presented. Information is included on the chemical standards for various byproduct feeds and special-purpose mixed feeds, tests of the hardness of cottonseed cake, and definitions of and standards for commercial unmixed feeds.

The effect of mechanical processing of feeds on the mastication and rumination of steers, C. H. Kick, P. Gerlaugh, A. F. Schalk, and E. A. Silver (*Jour. Agr. Res. [U. S.], 55 (1937), No. 8, pp. 587–597, figs. 4*).—The experimental rations employed in this study at the Ohio Experiment Station included alfalfa hay fed at four degrees of fineness, namely, whole, 2-in. cut, ¼-in. cut, and ground; mixtures of corn, protein concentrate, and alfalfa hay, in which shelled corn and ground corn were each fed with whole alfalfa; and a shelled corn-protein concentrate mixture with no source of roughage.

The cut hays were masticated more rapidly and with less chewing than the whole alfalfa, but cutting effected no economy in time or energy expended in rumination. Ground hay required less time and energy than long hay for both mastication and rumination. A comparison of the shelled and ground corn rations indicated that grinding corn actually increased the work required for mastication and had no significant effect on the energy required for rumina-

tion. The amount of mastication and rumination decreased as the proportion of grain to hay in the ration increased. The percentage of the daily time required for mastication ranged from 5.3 to 11 for the hay rations, from 3.6 to 6.4 for the hay-concentrate mixtures, and from 1.5 to 2.6 for the sole concentrate ration, and the percentage of daily time required for rumination ranged from 11.5 to 36.4, 7.3 to 17.1, and 4.5 to 6.7, respectively.

Sheep and wool production in Louisiana, M. G. SNELL (*Louisiana Sta. Circ. 20 (1937), pp. 29, figs. 14*).—A popular publication giving information on breeds of sheep suited to local conditions; the selection of sheep for breeding purposes; the breeding, feeding, and management of the flock; the desirability of grazing cattle and sheep together; factors affecting the yield, quality, and value of the wool; and the handling and marketing of the wool clip.

Sheep husbandry in Canada, J. B. SPENCER, rev. by A. A. MACMILLAN (*Canada Dept. Agr. Pub. 561 (1937), pp. 112, figs. 59*).—This is a popular bulletin dealing with breeds and breeding, feeding, management, and marketing of sheep in Canada.

Cobalt, and sheep diseases, J. B. E. PATTERSON (*Nature [London], 140 (1937), No. 3539, p. 363*).—This preliminary report of cobalt analysis of certain English pastures and soils indicates that on moorland areas where sheep have suffered from a type of anemia the cobalt content of the soil and pasture averaged 3.9 and 0.2 p. p. m., respectively, while on the lowland areas where sheep have shown recovery the soils and pastures contained 16.7 and 0.45 p. p. m. of cobalt, respectively.

Cobalt-feeding experiment at Arohena, C. S. M. HOPKIRK (*New Zeal. Jour. Agr., 54 (1937), No. 6, pp. 344–349, figs. 4*).—This experiment under the supervision of the verterinary laboratory of the New Zealand Department of Agriculture was conducted on a farm flock of sheep which had suffered from bush sickness. Three groups of animals, each containing four ewes and four lambs, were selected for cobalt treatment. The ewes were given cobalt sulfate drench equivalent to 1 mg of cobalt daily, and the lambs received one-half as much. One group was drenched twice weekly, a second group once per week, and a third once per month. Both ewes and lambs in the first two groups remained in excellent condition, and the lambs made good gains. The third group was less thrifty and the lambs made slow gains, although no deaths directly attributable to bush sickness occurred. An untreated control lot suffered severely. Several deaths occurred due to bush sickness, and cobalt was administered near the end of the test to prevent further death losses. It is concluded that frequent administrations of cobalt are effective in preventing bush sickness, but that because of the labor involved drenching cannot be considered a practical method. Supplying limonite licks high in cobalt is considered the most practical means available for combating this disease.

Rearing young pigs, I, II, V. C. FISHWICK (*Jour. Min. Agr. [Gt. Brit.], 44 (1937), Nos. 6, pp. 534–545, pl. 1, figs. 6; 7, pp. 645–650, pl. 1*).—Tests at the South Eastern Agricultural College have demonstrated the value of supplying a barley water-iron preparation to suckling pigs as a means of preventing anemia and scours and increasing the rate of growth. It is stated that the mixture is easy to prepare, easy and safe to use, and the cost is insignificant compared to the benefits.

Further tests gave evidence that with pigs which had received the above supplement between the ages of 2 and 6 weeks the decreased growth rate and other ill effects suffered during the postweaning period (from 8 to 12 weeks) could be avoided by the inclusion of from 10 to 15 percent of dried skim milk in the ration. Such ill effects could also be greatly reduced by continuing the barley

water-iron supplement to 12 weeks of age. Necrotic enteritis frequently encountered in weanling pigs apparently was associated with malnutrition.

The international situation and problems of horse-breeding: Survey of the development of horse-breeding throughout the world, E. Moskovits (*Roma: Internatl. Inst. Agr., 1936, pp. 70, pls. 2, figs. 3*).—This provisional report deals with the numerical development of horse stocks in the world, the causes and consequences of the variations in the total stocks of horses, and changes in the forms and aims of horse breeding.

A compilation of poultry articles, 1921–1937 (*Ohio Sta. Spec. Bul. 1 (1937), pp. [560], figs. [133]*).—This special poultry publication is a chronologically arranged compilation of 92 poultry articles, which have appeared in 64 issues of the Bimonthly Bulletin from 1921 to 1937, and also two monograph bulletins of the station on closely related subjects, thus making available in one volume a large amount of widely dispersed material.

[**Poultry Science Association, twenty-ninth annual meeting**] (*Poultry Sci., 16 (1937), No. 5, pp. 345–368*).—The abstracts of 80 papers presented before the twenty-ninth annual meeting held at the University of Wisconsin, August 10–13, 1937, are noted.

A study of the blood picture of poultry and its diagnostic significance, S. F. Cook (*Poultry Sci., 16 (1937), No. 5, pp. 291–296*).—Based on a study at the University of California, data are presented on the blood pictures of five groups of White Leghorn chickens reared on five different diets, including three standard commercial and two laboratory mixtures. Determinations were made at weekly intervals from approximately 4 to 20 weeks of age and included erythrocyte counts, hemoglobin content, clotting time, and total and differential leucocyte counts. Certain abnormalities in the normal blood picture were produced on the different rations which are considered to have a general diagnostic value.

A unilateral curvature of the breast musculature of a fowl with a curved breastbone [trans. title], H. Ullrich (*Arch. Geflügelk., 11 (1937), No. 5, pp. 166–168, figs. 2; Eng. abs., p. 168*).—This note describes a case of a pronounced unilateral curvature of the breast musculature observed in a fowl with curved breastbone. This finding is contrary to the opinion expressed by Carstens, Wenzler, and Prüfer (E. S. R., 76, p. 382).

Body weight, egg weight, sexual maturity, and growth rate in the domestic fowl, N. F. Waters (*Poultry Sci., 16 (1937), No. 5, pp. 305–313, figs. 2*).—The Iowa Experiment Station has analyzed data on periodic body weights, age of sexual maturity, and egg weights of 2,276 Single Comb White Leghorn fowls. Approximately the same maximum adult body weight was attained in all groups of birds at about 10 mo. of age. However, the rate of growth was found to be closely associated with sexual maturity. Birds maturing sexually at about 120 days of age grew faster during the first 6 mo. than did the later sexually maturing birds, but there was no indication that the ultimate body weight of a bird was affected by the age of sexual maturity. Maximum adult egg weight was attained when the bird reached maximum body weight, and after 11 mo. of age there was no significant increase or decrease in egg weight until about 16 mo. of age, at which time some fluctuation in egg weight was observed. Egg weight measurements during the eleventh to sixteenth months of age gave a reliable indication of the inherent egg weight for the first year. First-year egg weights were highly correlated with second- and third-year egg weights. The degree of correlation between the average yearly egg weight of daughters and dams and other combinations of ancestors is indicated.

Studies on the energy metabolism of the hen, H. H. Dukes (*Jour. Nutr., 14 (1937), No. 4, pp. 341–354, figs. 4*).—The results of 156 energy metabolism determinations on 54 hens of various breeds and ages and in different stages of fasting are reported. In prolonged fasting, the average basal respiratory quotient showed no great change after about the twenty-fourth hour, averaging about 0.73. The metabolic rate declined progressively until about the seventy-fifth hour, and then remained practically constant up to the one-hundredth hour of fasting. The average basal metabolism of mature hens after from 24 to 30 hours' fasting was approximately 2.4 calories per kilogram per hour or 32.4 calories per square meter per hour and was quite uniform for individual hens. Also most of the hens showed a fairly constant basal metabolism over a period of from 1 to 2 mo., although certain individuals showed marked variability. The average basal metabolism was lower in older hens. The heat loss due to water evaporation averaged 17 percent of the total heat loss (range 12 to 25 percent). Egg production was accompanied by a small increase in basal metabolism.

Cane molasses in poultry rations, C. W. Upp (*Louisiana Sta. Bul. 289 (1937), pp. 23*).—Information is presented on the effects of adding various percentages of molasses to all-mash laying rations, all-mash chick-growing rations, and finishing rations.

At the levels fed, molasses in the laying ration did not significantly affect the feed consumption, live weight gains, percentage mortality, or egg weight, and egg production on such rations compared favorably with that of the control group. Ten percent of molasses exerted a pronounced laxative effect and is considered the maximum amount permissible in the diet. It is recommended that not over 7.5 percent be used in an all-mash laying ration or 15 percent in a laying mash fed with grain.

Chick rations in which yellow corn was replaced by molasses at 5- or 10-percent levels resulted in practically as good growth as on the control ration. However, at the 15-percent level the ration proved excessively laxative for most chicks, and results were generally unsatisfactory. A ration containing 10 percent of molasses in place of rice bran was definitely inferior to the check ration, perosis occurring consistently in the lots which received no rice bran. It is recommended that not more than from 5 to 7 percent of molasses be included in the chick ration.

Rations containing 10 or 15 percent of molasses with 8 percent of dried buttermilk and 7 percent of cottonseed meal gave good results during short fattening periods. Increasing the percentage of buttermilk caused such rations to be too laxative. A single test indicated that the dressing percentage of molasses-fed hens was somewhat higher than that for the check group. No difference was evident in the palatability of broilers receiving the different rations.

The cannibalism preventing properties of oats, M. W. Miller and G. E. Bearse (*Poultry Sci., 16 (1937), No. 5, pp. 314–321*).—The Western Washington Experiment Station reports the results of four feeding trials with growing and laying pullets, in one of which oats was compared with corn as the sole cereal in the ration. In two other trials oats, corn, and wheat were compared, and in the last trial oats, corn, wheat, and barley.

In each instance oats as the sole cereal in the ration significantly reduced cannibalism below that experienced on rations containing corn as the only cereal, with wheat and barley rations being intermediate in this respect. The growth value of the grains as measured by body weights at 8 weeks of age and at the time of first egg production showed oats first in each instance,

followed by corn, wheat, and barley in order, although the corn-fed group averaged slightly heavier in weight at 24 weeks of age.

Effects of light, soybean, and other diet supplements on seasonal hatchability and egg production, T. C. BYERLY, H. W. TITUS, N. R. ELLIS, and R. B. NESTLER (*Poultry Sci., 16 (1937), No. 5, pp. 322–330, figs. 2*).—In further investigations by the U. S. D. A. Bureau of Animal Industry (E. S. R., 69, p. 96), 12 pens of 25 Single Comb Rhode Island Red pullets each were employed, of which eight received rations containing 20 percent of expeller process soybean meal from Illini soybeans as the only protein concentrate, while the four positive control pens received 20 percent of beef scrap as the principal source of protein. The various combinations of supplements included carotene plus artificial light, 2 percent of cod-liver oil plus artificial light, carotene plus sunlight, 2 percent of cod-liver oil plus sunlight, 3 percent and 4 percent of cod-liver oil plus artificial light, and carotene or cod-liver oil plus red light.

With the soybean meal as the sole protein concentrate there was very low winter hatchability, indicating that the Illini soybean is markedly deficient in an essential hatchability factor. The soybean-fed groups having access to sunlight gave consistently better hatchability during the spring and summer months than the corresponding confined groups receiving cod-liver oil, leading to the conclusion that sunlight increased hatchability by some mechanism other than vitamin D. Egg production was significantly greater in pens receiving direct sunlight than in the confined pens adequately supplied with cod-liver oil. The differences in production between the soybean meal-fed groups and the paired beef scrap-fed groups were insignificant. The Illini soybean is considered to be intermediate in deficiency between the very unsatisfactory Mammoth Yellow variety and the fairly adequate Wilson variety previously tested.

A study of the pathological conditions in the embryonic development of the chicken during artificial incubation, [I]–III [trans. title], E. E. PENJONSCHKEWITSCH (*Arch. Geflügelk., 8 (1934), Nos. 6, pp. 182–197, figs. 5, Eng. abs., p. 197; 9, pp. 273–280, figs. 2, Eng. abs., p. 280; 11 (1937), No. 1–2, pp. 1–19, fig. 1, Eng. abs.. pp. 17–19*).—These experiments were carried on in the Soviet Union. The first study presents information on various pathological symptoms in the chick embryo arising as a result of variations in temperature and humidity during the incubation period. The blood picture during embryonic development at different temperatures and humidities is indicated. It is stated that failure to maintain the optimum temperature or humidity is accompanied by specific phenomena which are characteristic of every kind of variation and specific to every case. The value of the described technic as a means of diagnosing incubation troubles is pointed out.

II. *The variation in the active reaction (pH) of the albumin and yolk of eggs, with different conditions of incubation.*—The pH curves for the albumin and yolk of four lots of eggs each subjected to a different combination of temperature and humidity during incubation are presented. The albumin reaction of all groups changed in about the same manner up to the fifth day. High temperatures tended to quicken the biochemical process in the albumin, whereas low temperatures and high moisture content each tended to retard the process beyond the fifth day. Neither high nor low temperature exerted a significant effect on the biochemical process in the yolk up to the ninth day, but beyond this point high temperatures significantly increased the rate of the process. High moisture increased the process in yolk over the high-temperature group during the first three days, and both groups rose continuously and ultimately exceeded the normal group by a considerable extent.

III. *The gas permeability of the inner shell membrane.*—This investigation, dealing with the differences in specific structure and permeability of the inner and outer shell membranes and the effects of varying temperature and humidity conditions during incubation on membrane permeability, led to the following conclusions: (1) The diminution of gas permeability of the shell membranes of infertile eggs after 5 days' incubation as compared with fresh eggs indicated that the permeability of the latter is directly correlated with the physical conditions of incubation. When humidity and temperature were maintained at 79 percent and 38.2° C., 62.1 percent and 38.1°, and 62 percent and 40°, the average gas permeability of the membrane equaled 12 min. 27 sec., 7 min. 45 sec., and 7 min. 9 sec., respectively; (2) the gas permeability of shell membranes may be restored under altered environmental physical conditions or by internal factors that are related to embryonic development; (3) rather large variations in the value of gas permeability were encountered; (4) in the course of incubation the moisture content of the shell membranes increases while their permeability decreases, and the drying out of the shell membranes increases their permeability; and (5) the air permeability of the shell membranes of eggs with dead germs was on the average somewhat higher than in eggs with live embryos, and approximately 6 percent of the membranes of fresh eggs and of eggs with live embryos were impervious.

A test of the accuracy of trap-nest records, W. A. Hendricks (*Poultry Sci., 16 (1937), No. 5, pp. 297–300*).—In further consideration of this problem (E. S. R., 77, p. 527), the author discusses and presents examples of the application of the chi-square test to trap nest records of a single flock of poultry over a number of months and also to five sets of yearly trap nest records from various flocks. The general applicability of the test and precautions to be observed in its application are pointed out.

Turkey feeding experiments, T. H. Jukes (*Flour & Feed, 38 (1937), No. 5, pp. 17, 19*).—This report of practical feeding tests with turkey poults at the California Experiment Station presents significant information on the protein and vitamin requirements of turkeys and indicates ways by which relatively low-priced feeding stuffs, such as rice bran, white milo, and dehydrated cane molasses, may be successfully used in turkey rations.

Turkey production in Kansas, H. M. Scott (*Kansas Sta. Bul. 276 (1937), pp. 95, figs. 46*).—This bulletin presents the results of much original research and also numerous citations from the literature relating to the problem.

The principal topics of discussion are the trend of the industry in the United States and in Kansas, the selection and management of the breeding stock, incubation, artificial brooding, range management, nutrition experiments, rations and feeding practices, growth and feed consumption, marketing, a State-wide improvement program, and turkey diseases and their control.

Turkeys, their care and management, A. G. Taylor (*Canada Dept. Agr. Pub. 587 (1937), pp. 12, figs. 4*).—This is a popular discussion of the various factors involved in successful turkey production.

DAIRY FARMING—DAIRYING

Research in dairy problems (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 108, 109*).—Progress is noted with regard to the utilization of roughage crops to the best advantage for milk production, methods of preserving roughages, and the recording of the identity and production performance of animals in dairy herd improvement associations as a means of locating desirable sires and extending the proved sire system of breeding.

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 352 (1937), pp. 41, 42, 43*).—Reports of dairy cattle investigations include the vitamin D requirements of calves and the vitamin A requirements of dairy cows, both by S. I. Bechdel and N. B. Guerrant; and the effects of 2 percent bonemeal in the dairy ration, by Bechdel and P. S. Williams.

Studies with dairy products gave information on the preservation of concentrated milk by freezing and the relative digestibility of soft-curd and hard-curd milks, both by F. J. Doan; factors influencing the curing of cheese and various causes of off-flavors in milk, both by C. D. Dahle; and suitable media for determining the presence of the *Escherichia-Aerobacter* group of bacteria in milk and water, by M. A. Farrell.

The National Institute for Research in Dairying, 1912–1937.—Twenty-fifth anniversary review by the staff of the Institute (*Reading, Eng.: Natl. Inst. Res. Dairying, [1937], pp. I, III, IV+59, figs. 5*).—The activities of the institute are set forth.

In-vitro synthesis of lactose, W. E. Petersen and J. C. Shaw (*Science, 86 (1937), No. 2235, p. 398*).—The authors, working at the University of Minnesota, have demonstrated that the synthesis of lactose can be brought about by adding macerated mammary gland tissue from lactating cows to solutions of glucose, with lactic acid and various salts of lactic acid, and incubating at 37° C. These results lend support to the idea that lactic acid is concerned with the synthesis of lactose in milk.

The glucose tolerance of the cow: A preliminary report, O. F. Reihart (*North Amer. Vet., 18 (1937), No. 8, pp. 25–28, 29, figs. 5*).—By intravenously injecting varying amounts of glucose (range from 12 to 266 mg per kilogram of body weight) into a cow and noting the effect on the sugar level of the blood and urine at frequent intervals, it was ascertained that the cow has a rather low glucose tolerance, not exceeding 47 mg per kilogram of body weight. Injections of greater amounts of glucose resulted in the prompt elimination of sugar in the urine. The injection of 27 mg per kilogram of body weight stimulated sugar metabolism as indicated by the fall in blood sugar and the disappearance of sugar from the urine.

Further studies on the growth promoting factor associated with summer milk, G. O. Kohler, C. A. Elvehjem, and E. B. Hart (*Jour. Nutr., 14 (1937), No. 2, pp. 131–144, fig. 1*).—Continuing this line of investigation (E. S. R., 76, p. 90), rat feeding tests were conducted to determine the growth-promoting properties of winter-produced milk from individual cows of different breeds and on various winter rations and the effect of adding various supplements to winter-produced milk. Special precautions were taken in handling the young rats during the suckling stage to prevent them from obtaining a store of growth-promoting factors from any source other than their mother's milk. In all trials mineralized milk was fed ad libitum as the sole diet.

The growth-promoting value of unsupplemented milk varied considerably with individual cows, growth rates generally ranging from 2 to 2.8 g per rat daily. Such variations generally overshadowed any effects of breed or ordinary changes in the winter rations. From the series of supplements added to milk, growth was markedly stimulated by daily administration of 3 g of fresh grass or 3 cc of grass juice and to a less marked degree by 0.6 g of dried oatgrass, 0.2 g of rice bran, or 0.2 g of liver extract. That the growth-promoting principles present in these supplements are other than the well-known essential food factors was indicated by the inferior growth response resulting from feeding 2 drops of cod-liver oil, 1 cc of orange juice, 0.5 g of brewers' yeast, 0.25 g of dried brain, and 1 g of defatted wheat germ. The increased growth from the

fresh grass or grass juice supplements was accompanied by an increase in milk consumption, suggesting the inappropriateness of the paired feeding technic in such studies.

Regulating the feeding of certain roughages to minimize their influence on the flavor of milk, C. L. ROADHOUSE and J. L. HENDERSON (*Jour. Dairy Sci.*, *20* (*1937*), *No. 10*, *pp. 679–683*).—The effect of eight different feeding regimes for a milking herd on the flavor of milk was studied by the California Experiment Station.

Cows receiving alfalfa hay as roughage and given access to the hay immediately after milking did not consume enough hay in the 5-hr. period before milking to seriously affect the milk flavor. Cows given access to alfalfa pasture both day and night for the entire interval between milkings produced milk with good flavor, but when given access to the pasture only during the day they consumed sufficient hay during the 5-hr. period before milking to impart an objectionable feed flavor to their milk. Pasturing cows on Sudan grass during the day only did not result in objectionable milk flavors. Heavy feeding (18.9 lb. per cow) of corn silage previous to milking resulted in a distinct objectionable feed flavor, while light feeding (14.2 lb. per cow) was less detrimental but was still objectionable. If a large amount of corn silage is used, it should be fed shortly after milking. The flavor differences resulting from the different feeding regimes were highly significant statistically.

Acidosis: A cause of off-flavoured milk, H. BARKWORTH (*Milk Indus.*, *18* (*1937*), *No. 4*, *p. 70*).—This note from the South-Eastern Agricultural College discusses the probability of acidosis (ketosis or acetonemia) in milking cows resulting in the production of off-flavored milk. One specific case is cited as evidence. A simple test for detecting the presence of acetone in milk is described.

Growth of Streptococcus pyogenes in milk stored at atmospheric temperatures, E. J. PULLINGER and A. E. KEMP (*Jour. Hyg.* [*London*], *37* (*1937*), *No. 4*, *pp. 527–538*, *fig. 1*).—This report from the Royal Veterinary College presents experimental evidence that in fresh raw milk or in laboratory pasteurized milk *S. pyogenes* begins to multiply slowly only after from 48 to 72 hr. of storage at from 18° to 22° C. In both commercially pasteurized and raw graded milk bottled for distribution, souring occurred too rapidly to permit multiplication of *S. pyogenes* after artificial inoculation. The initial degree of contamination had no influence upon the organism's ability to multiply during storage. The failure of *S. pyogenes* to multiply during storage was attributed to the lack of optimum growth temperature, the bacteriostatic action of the milk, and the rapidity with which saprophytic bacteria multiply at atmospheric temperatures. These findings indicate that widespread epidemics are rarely due to extensive multiplication of *S. pyogenes* in milk during commercial or household storage.

An evaluation of formate-ricinoleate broth for the detection of colon organisms in raw and pasteurized milk, I. C. GUNSALUS and C. N. STARK (*Jour. Bact.*, *34* (*1937*), *No. 3*, *p. 348*).—Tests at the [New York] Cornell Experiment Station with a large number of samples of both pasteurized and raw milks indicated that a very high percentage of the cases giving a positive presumptive test for the presence of the *Escherichia-Aerobacter* group of organisms in formate-ricinoleate broth were confirmed by Standard Methods, particularly in the pasteurized lots. Comparative tests on 221 samples of pasteurized milk indicated that formate-ricinoleate broth, brilliant green 2-percent bile broth, and certain enrichment procedures followed by inoculation into formate-ricinoleate broth gave approximately the same number of positive pre-

sumptive tests. Organisms which according to Standard Methods gave false presumptive tests were found to belong to the *Proteus Aerobacter* and *Escherichia* and related groups.

Citrate-ricinoleate agar for the detection of Escherichia, Aerobacter, and proteolytic Gram-negative rods in milk, M. L. Littman and C. N. Stark (*Jour. Bact., 34 (1937), No. 3, pp. 348, 349*).—The composition of the citrate-ricinoleate agar used in these tests at the [New York] Cornell Experiment Station was 0.5 percent peptone, 0.1 percent sodium ricinoleate, 0.4 percent sodium citrate, 0.2 percent sodium nitrate, 1.5 percent agar, neutral red 1 : 20,000, and bromothymol blue 1 : 20,000, with the pH adjusted to 7.0. It was found that by plating milk samples on this medium it was possible to differentiate and enumerate *Escherichia*, *Aerobacter*, and proteolytic Gram-negative rods.

The effect of temperature and time of storage of cream on the rate and type of deterioration, W. H. Martin, A. C. Fay, and W. J. Caulfield (*Jour. Dairy Sci., 20 (1937), No. 10, pp. 667–678, figs. 2*).—In trials at the Kansas Experiment Station, eight separate lots of No. 1 grade sweet cream (35 percent fat) were each divided into nine equal portions which were placed in separate incubators adjusted to operate at temperatures of 50°, 55°, 60°, 65°, 70°, 75°, 80°, 85°, and 90° F., respectively. Samples were examined daily up to 16 days for rate and type of deterioration.

The time required for cream to change from first to second grade and from second to third grade was closely related to the storage temperature. Cream soured in from 1 to 6 days, souring more rapidly as the temperature increased. Stale flavors were more prevalent at low temperatures after several days storage; putrid flavors occurred at both high and low temperatures, but were not observed in lots stored at from 60° to 75°; bitter flavor was retarded by low temperature and varied widely in time of appearance; unclean flavors appeared early in the storage period; rancidity occurred in from 3 to 9 days in all samples held above 60°; cheesy flavors usually appeared in samples above 65°; and yeastiness appeared in from 4 to 5 days at a temperature of 85° or 90°, but was definitely retarded at lower temperatures.

Cream at the lower storage temperatures was rated second grade at lower levels of acidity than when stored at high temperatures. The pH values of cream revealed little information not indicated by total acidity. The difference in rate of proteolysis between good and poor creams was more marked at lower temperatures. The data obtained raise some question as to the validity of the formol titration method as an index of undesirable conditions.

A study of some factors in the butter churning process, D. Levowitz and P. A. van der Meulen (*Jour. Dairy Sci., 20 (1937), No. 10, pp. 657–665, figs. 3*).—This report of a study at Rutgers University presents information on the thickness of the casein film adsorbed on oil globules when a mineral oil was emulsified in an aqueous solution of casein and the effect of certain factors on the churnability of modified creams. By adding various concentrations of solutions of casein, lecithin, or a casein-lecithin mixture to washed cream and determining the time required for churning, it was found that the relative electrical potential of the butterfat globules and the viscosity of the interglobular solutions had little, if any, effect on churning time. The theory is advanced that churning is due to the setting free of butterfat from the less stable globules, followed by a cementing of the more stable protected globules into clumps, by the free butterfat. In support of this theory butter was produced without churning from cream in which the stability of the globules was lowered by decreasing the concentration of serum solids and raising the temperature.

Power requirements for freezing ice cream, W. J. Caulfield, C. K. Otis, and W. H. Martin (*Jour. Dairy Sci., 20 (1937), No. 10, pp. 645–655, figs. 4*).—The Kansas Experiment Station has investigated the effects of various factors on the operating efficiency of a 40-qt., direct-expansion ice cream freezer. Reduction of the temperature at which the refrigerant was cut off from 25.5° F. to 24° or 22.5° resulted in a decline in dasher speed, an increase in the time required to reach a 100-percent overrun, and a marked increase in the energy input to the motor and the total power used in freezing. The quality of the ice cream was slightly improved at the lower temperature. The addition of proper amounts of stabilizers to a standard mix slightly increased the freezing time and the total power required. The addition of egg yolk to a standard mix materially reduced the time required to reach 100-percent overrun and also the total power required, but increased the energy input to the motor.

Substituting a 5-hp. for the 3-hp. motor improved the operating efficiency of the freezer without increasing the total power consumed. The larger motor was never overloaded, whereas the 3-hp. motor was seriously overloaded, particularly when a mix containing egg yolk was frozen and the refrigerant cut off at 24°. Increasing the dasher speed from 170 to 200 r. p. m. resulted in a slight saving in the time required to reach 100-percent overrun but did not significantly affect the quality of the ice cream or the total power requirement.

The bacteriological quality of the ice cream supply for a small city, M. W. Yale and R. C. Hickey (*New York State Sta. Tech. Bul. 248 (1937), pp. 30*).—The total number of samples analyzed in this study, representing the ice cream supplied by 12 manufacturers to Geneva, N. Y., included 77 process samples from 7 plants, 137 ice cream samples from 12 retail stores, and 36 dipper water samples from 18 establishments. Total bacterial counts were obtained on all ice cream samples, both on standard agar at 37° C. for 48 hr. and on tryptone-glucose-milk agar at 32° for 48 hr., while all coliform counts were made on violet-red bile agar after 24 hr. at 37°.

Bacterial counts of the process samples revealed that either gelatin or color was a serious source of contamination in four of the seven plants, while freezing equipment gave excessive contamination in two instances. Three manufacturers out of the twelve had all standard plate counts under 100,000 per gram, and eight had an average logarithmic standard plate count of less than 100,000 per gram. The average count of all store samples of ice cream was 59,800 per gram. The total counts on the trptone-glucose-milk agar averaged higher than the standard plate count on 92 percent of the samples. A comparison of the bacterial content of samples collected aseptically and those collected with the vendor's dipper indicated that standard plate counts are not sufficiently sensitive to show dipper contamination, while coliform counts proved more useful in detecting this type of contamination. Bacterial counts of dipper waters were considered less satisfactory than actual examination of the dippers for determining their sanitary condition. No previous bacterial control had been exercised in nine of the 12 plants. It is suggested that a bacterial standard of 100,000 per gram is one that can be met by the industry, even when improved agar and lower incubation temperatures are employed in making the counts.

VETERINARY MEDICINE

[Control of diseases of livestock and wildlife] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 95–97, 107, 108*).—The progress of control work with Bang's disease, bovine tuberculosis, and hog cholera, work with trichinae in pork, control of diseases of wildlife, and parasite control and the work of the serum-virus control board are described.

Review of ten years of study of livestock diseases, W. T. Hardy (*Southwest. Sheep and Goat Raiser, 7 (1937), No. 20, pp. 9, 24*).—A brief practical review of the diseases of sheep, goats, and cattle encountered by the Sonora, Tex., Substation during the past 10 yr. is presented.

[Work in animal parasitology by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1936, pp. 74–80*).—The value of sunlight in Puerto Rico in the destruction of the eggs and larvae of parasitic nematodes, an account of which has been noted (E. S. R., 76, p. 848); the failure of yaragua grass (*Melinis minutiflora*) to check worm parasites; the common frog and garden snake as intermediate hosts of a tapeworm of dogs and cats, *Diphyllobothrium mansoni;* the cat lungworm *Aelurostrongylus abstrusus;* brilliant green dye effective as a teniacide but toxic to poultry; the abundance of the small tapeworm *Hymenolepis cantaniana* in island chickens; the occurrence of pox, moquillo, and fowl cholera; the failure of attempts to find the intermediate host of the cattle tapeworm *Moniezia expansa;* liver fluke (*Fasciola hepatica*) infestation of cattle; the use of a manure bag as a control measure for internal parasites of the goat; and the extraction and drying of toad venom for experimental purposes are dealt with in this report (E. S. R., 75, p. 840). A list of the parasites found in dogs and cats in Puerto Rico and one showing the variety, incidence, and intensity of infestation by intestinal parasites in a flock of 44 adult hens at Mayaguez in 1935 are included.

Report of the veterinary service for the year ended March 1936, J. M. Smith et al. (*Palestine Dept. Agr. and Forests Ann. Rpt., 1936, pp. 85–156*).—This report (E. S. R., 78, p. 100) includes an account of the occurrence of and control work with diseases and parasites of domestic animals, by J. M. Smith, followed by the report of the veterinary pathologist, S. J. Gilbert (pp. 113–118).

Report of the chief veterinary research officer (*Kenya Dept. Agr. Ann. Rpt., 1936, vol. 2, pp. 55–87*).—The research work of the year (E. S. R., 77, p. 391), particularly with rinderpest, is reported, that with chemotherapy of *Trypanosoma congolense* being presented at length in table form.

Annual report of the department of veterinary science and animal husbandry, 1936, H. E. Hornby et al. (*Tanganyika Dept. Vet. Sci. and Anim. Husb. Ann. Rpt., 1936, pp. 55*).—Control work with rinderpest and other diseases of livestock and the results of miscellaneous experiments with rinderpest are included in this annual report (E. S. R., 78, p. 246).

The control of animal diseases in relation to overstocking and soil erosion, H. E. Hornby (*Empire Jour. Expt. Agr., 5 (1937), No. 18, pp. 143–154*).—A contribution based upon observations in Tanganyika and prepared by the director of veterinary services.

A list of parasites of domestic animals arranged according to their sites of infestation, compiled and prepared by A. I. Mallari (*Philippine Jour. Anim. Indus., 4 (1937), No. 4, pp. 287–320*).—The host list of parasites of domestic animals here presented is arranged in three main groups, namely, parasitic arthropods, parasitic helminths, and parasitic protozoa. This is followed by a list of the parasites of domestic animals of economic importance in the Philippines and 21 references to the literature.

The molluscan hosts of Fasciola gigantica in the Philippines, F. S. Manipol (*Univ. Philippines, Nat. and Appl. Sci. Bul., 5 (1936), No. 4, pp. 335–362, pls. 2*).—Three snails, namely, *Lymnaea philippinensis, L. swinhoei,* and *Amphipeplea cumingiana,* were subjected to experimental infection with the miracidia of *F. gigantica.* This is a fluke commonly found in the bile duct of such herbivorous animals as cattle, carabao, goat, sheep, giraffe, and zebra, and has been reported several times in man. All three species gave off cercariae which devel-

oped into cysts. After being fed to various mammalian hosts, including guinea pigs, rabbits, sheep, and goats, these metacercariae developed into adult flukes, indicating that all three species are secondary hosts of the fluke in the Philippines.

L. swinhoei is apparently the most susceptible to infestation by the fluke larvae and *A. cumingiana* the least. Since it is probable that *L. swinhoei* has been imported into the Philippines in aquariums along with ornamental fishes from China and elsewhere, it is suggested that adequate measures be taken to prevent the spread of this snail, lest it should bring about epidemics of liver rot.

Studies in chemotherapy, I–VI (*Pub. Health Rpts. [U. S.], 49 (1934), No. 31, pp. 908–911; 52 (1937), Nos. 2, pp. 48–53; 7, pp. 192–196; 21, pp. 662–671, figs. 8; 22, pp. 685–695, figs. 3; 36, pp. 1211–1217, figs. 2*).—The first three studies reported are by S. M. Rosenthal and include (1) the action of sodium formaldehyde sulfoxylate in bacterial infections (pp. 908–911), (2) the chemotherapy of experimental pneumococcus infections (pp. 48–53), and (3) the effect of *p*-aminobenzene sulfonamide on pneumococci in vitro (pp. 192–196). Part 4, by S. M. Rosenthal, H. Bauer, and S. E. Branham, deals with comparative studies of sulfonamide compounds in experimental pneumococcus, streptococcus, and meningococcus infections (pp. 662–671); part 5, by S. E. Branham and S. M. Rosenthal, with sulfanilamide, serum, and combined drug and serum therapy in experimental meningococcus and pneumococcus infections in mice (pp. 685–695); and part 6, by S. M. Rosenthal, J. G. Wooley, and H. Bauer, with the chemotherapy of choriomeningitis virus infection in mice with sulfonamide compounds (pp. 1211–1217).

The immunological reactions of the filterable viruses, F. M. BURNET, E. V. KEOGH, and D. LUSH (*Austral. Jour. Expt. Biol. and Med. Sci., 15 (1937), No. 3, Sup., pp. 227–368, figs. 27*).—Chapters on vaccinia virus, influenza, louping ill, Rift Valley fever, equine encephalomyelitis virus, Newcastle disease virus, infectious laryngotracheitis of fowls, and myxomatosis of rabbits and a summary of the immunological reactions of animal pathogenic viruses are included in the 17 that comprise this contribution.

The bacteriostatic action of p-aminobenzenesulphonamide upon haemolytic streptococci, H. FINKLESTONE-SAYLISS, C. G. PAINE, and L. B. PATRICK (*Lancet [London], 1937, II, No. 14, pp. 792–795, figs. 2*).—The bacteriostatic action of sulfanilamide upon hemolytic streptococci was found to be preceded by a phase of growth stimulation. The growth stimulation is more conspicuous in young cultures than in cultures that have passed through the logarithmic phase of growth. Sulfanilamide is more soluble in the fatty envelope which can be separated from hemolytic streptococci than in aqueous solution. The significance of this, with regard to its stimulatory and bacteriostatic actions, is discussed. It does not appear to modify the activities of polymorphonuclear leucocytes. It stimulates the phagocytic activity of reticulo-endothelial cells of rabbits, the significance of which with regard to its action in infections of human subjects has not been investigated. The production of polymorphonuclear leucocytes by the bone marrow in rabbits is stimulated. Attention is drawn to certain minor toxic effects of the drug.

The renal excretion of sulfanilamide, E. K. MARSHALL, JR., K. EMERSON, JR., and W. C. CUTTING (*Jour. Pharmacol. and Expt. Ther., 61 (1937), No. 2, pp. 191–195, figs. 2*).—In a study aimed at the determination of the mode of its excretion by the kidney, the sulfanilamide clearance in the dog was found to be from 20 to 30 percent of the simultaneously determined creatinine clearance. The clearance of sulfanilamide is independent of plasma level and is increased by an increased rate of urine flow.

The elimination of selenium and its distribution in the tissues, M. I. Smith, B. B. Westfall, and E. F. Stohlman, Jr. (*Pub. Health Rpts.* [*U. S.*], *52* (*1937*), *No. 35, pp. 1171–1177*).—It has been found (E. S. R., 78, p. 247) that "in chronic poisoning with inorganic selenium the element is widely distributed throughout the body tissues, being found in highest concentrations in the liver, kidney, spleen, pancreas, heart, and lungs. In the blood there is more selenium in the erythrocytes than in the plasma. The bulk of stored selenium in chronic poisoning with small doses of inorganic selenium is eliminated within 2 weeks after its administration is discontinued. Small amounts persist in the urine and in some of the tissues, especially the liver, for a month, and possibly longer."

Toxicology of selenium.—IV, Effects of exposure to hydrogen selenide, H. C. Dudley and J. W. Miller (*Pub. Health Rpts.* [*U. S.*], *52* (*1937*), *No. 36, pp. 1217–1231, figs. 2*).—In further studies (E. S. R., 76, p. 439) guinea pigs were exposed to hyrogen selenide in accurately controlled concentrations ranging from 0.57 to 0.002 mg per liter for single exposures of 10, 30, and 60 min. The apparatus is described in detail. "All animals exposed to 0.57 mg per liter for 10 min. died within 5 days; 93 percent of the animals exposed to 0.043 mg per liter for 30 min. died within 30 days; and all animals exposed to 0.02 mg per liter for 60 min. died within 25 days. The pathological changes resulting from the exposures were, primarily, an early fatty metamorphosis of the liver and a hypertrophy of the spleen which developed later."

Chemical constitution and biological properties of the endo-antigen of the Brucella group of micro-organisms, R. B. Pennell and I. F. Huddleson (*Michigan Sta. Tech. Bul. 156* (*1937*), *pp. 31, fig. 1*).—In reporting upon further work (E. S. R., 71, p. 439; 74, p. 393; 78, p. 249), a description is given of a method for the preparation from cells of *B. abortus*, *B. melitensis*, and *B. suis* of a highly antigenic fraction, the endoantigen, which is toxic for normal guinea pigs and which precipitates immune serum in dilutions of from 1–500,000 to 1–5,000,000.

"Endoantigens obtained from the three species of *Brucella* are grossly similar. The endoantigen comprises roughly 25 percent of the bacterial cell. While containing the same or similar constituents, however, the endoantigens from the three organisms have been shown to differ markedly in the distribution of some of these constituents.

"Positive reactions are given to the Molisch test, the biuret test, Millon's test, Bial's test, and a very slight reaction to the Rosenheim test. The nitrogen content of the fraction varies from 6 to 8 percent. Reducing sugars are absent before hydrolysis. Calculated as glucose after hydrolysis, reducing sugars represent from 4 to 12 percent of the endoantigen. Amino nitrogen, phosphorus, and sulfur are absent. In the determination of acetyl groups distillable acid representing an average of 6 percent of the endoantigen is obtained. This acid is presumably acetic acid, although that product has not been isolated. From the endoantigen there may be extracted by acetone and ether a compound having the properties of a diketone, and an acetone soluble, saturated liquid fatty acid. These two compounds represent from 10 to 15 percent of the fraction. The acetone-ether extracted product still reacts positively to the above-mentioned qualitative tests. Tryptophan and tyrosine have been found to represent 18.92 percent and 8.45 percent, 11.46 percent and 0 percent, 7 percent and 9.29 percent of the extracted endoantigens of *B. melitensis*, *B. abortus*, and *B. suis*, respectively. From the remaining 65 to 70 percent of the original fraction there has been obtained an unidentified nitrogenous fraction and an optically inactive sugar acid. These are obtained in quantities such as to preclude the occurrence of any further compounds in a significant amount.

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"The endoantigen is shown to be relatively stable in the presence of dilute acid and dilute alkali upon heating and upon long standing. Its activity is not completely destroyed by hydrolysis with dilute acids but is destroyed by similar treatment with dilute alkali. The ability to precipitate specific serum is lessened by extraction with acetone and ether but is enhanced by acetylation or by treatment with 25 percent NH_4OH. The toxicity and antigenicity of the endoantigen are shown to be dependent upon proper dosage, an overdosage as well as an underdosage giving poor results. The toxicity and antigenicity are increased by lipide extraction of the endoantigen. Acetylation causes a distinct decline in toxicity but a marked increase in antigenicity.

"The endoantigen elicits specific skin reactions in sensitized animals, the lipide-extracted and the acetylated endoantigens showing some species specificity in this reaction. Injections of endoantigen have failed to protect normal guinea pigs from subsequent exposure to virulent *Brucella* organisms and have failed to alter the course of the disease in infected pigs. Experiments with cattle and humans, however, seem to promise immunizing and therapeutic value to the endoantigen.

"Injection of the endoantigen causes a hyperglycemia followed by a hypoglycemia in experimental animals. The basal metabolism of injected animals is at first stimulated and then depressed. A leucopenia, chiefly due to the disappearance of neutrophiles from the peripheral blood, follows injection of the endoantigen into normal guinea pigs.

"The endoantigen may be produced from the previously described albuminoid fraction of the *Brucella*, thus accounting for the toxicity of that fraction and suggesting that this albuminoid is a combination of the endoantigen with a proteinlike group. The endoantigen is shown to be similar to or possibly identical with the previously described S-substance [E. S. R., 71, p. 439], the latter being probably a partially hydrolyzed endoantigen."

Centrifugation studies.—III, The viruses of foot-and-mouth disease and vesicular stomatitis, W. J. Elford and I. A. Galloway (*Brit. Jour. Expt. Path., 18 (1937), No. 2, pp. 155–161*).—The inverted capillary tube technic for studying the behavior of suspensions in centrifugal fields has been successfully applied in studies with the virus of foot-and-mouth disease—one of the smallest of known animal viruses. Measurements of the rate of sedimentation of the virus are recorded, and its particle size for a density value 1:30 is calculated to be 20 mμ. This result is discussed in relation to the earlier value given by ultrafiltration analysis. Evidence from centrifugation experiments is advanced, supporting that previously given by ultrafiltration analysis, for the view that the particles of the virus of foot-and-mouth disease are relatively uniform in size. All strains, too, are found to have the same particle size. Measurements of the rate of sedimentation of the virus of vesicular stomatitis are also recorded. The particle diameter of this virus is found to be 74 or 60 mμ, according to whether the density of the particles is assumed to be 1:20 or 1:30, respectively.

The present status of knowledge of the animal rickettsioses [trans. title], A. Donatien and F. Lestoquard (*Arch. Inst. Pasteur Algérie, 15 (1937), No. 2, pp. 142–187, pls. 6, figs. 9*).—This review is presented with a list of 29 references to the literature.

Do the Rickettsias confer a true immunity or premunition? [trans. title], G. Parrot (*Arch. Inst. Pasteur Algérie, 15 (1937), No. 2, pp. 188–213*).—It is concluded that the resistance to reinfection conferred by the Rickettsias is dependent upon a chronic latent infection corresponding to the premunition

of Sergent and his associates[1] (also E. S. R., 75, p. 588) and not to a true immunity. A list is given of 89 references to the literature.

***Experiments on the transmission of rinderpest through the agency of* Stomoxys calcitrans Linn.**, S. K. SEN and A. SALAM (*Indian Jour. Vet. Sci. and Anim. Husb.*, 7 (1937), No. 3, pp. 219–224, fig. 1).—In the experiments reported the stablefly was found incapable of transmitting rinderpest. A description is given of a method for feeding a large number of flies singly, by the "interrupted" method, within a short period of time.

Staphylococcus antitoxin in the blood and milk of cows and other animals, F. C. MINETT (*Jour. Compar. Path. and Ther.*, 50 (1937), No. 3, pp. 173–190, figs. 15).—It has been found that in cattle (male and female) and in goats, as in some other animals, there is a direct relationship between the age of the animal and the staphylococcus antitoxin titer of its blood. Evidence is brought forward by the author to show that "the presence of antitoxin in the blood of cows is determined in part by infection of the udder with *Staph*[*ylococcus*] *aureus*, and in the same connection it may be noted that the incidence of udder infection with *S. aureus* also increases with age. As would be expected, in cows and sheep injections of staphylococcus toxoid lead to an increased concentration of antitoxin in the blood, and this is reflected at times by an increase of antitoxin in the milk. Staphylococcus toxin can be demonstrated in the udder secretion of acute cases of staphylococcus mastitis. In the milk whey from normal quarters the amount of antitoxin present is usually 1/80 to 1/40 of that in the blood serum, whereas in colostrum the quantity of antitoxin may equal or even exceed that present in the blood. When the quarter is inflamed, e. g., as a result of streptococcus infection, the amount of staphylococcus antitoxin in the whey rises. The facts brought forward in this paper have a bearing on the general question of the source of 'natural' antitoxin in blood and of antibodies in milk."

Changes in the sedimentation rates of the red blood corpuscles during trypanosome infections, M. H. FRENCH (*Jour. Compar. Path. and Ther.*, 50 (1937), No. 3, pp. 191–194).—Figures are given which show a big difference in the sedimentation rates of normal healthy cattle and sheep blood when compared with donkeys' blood. Increased sedimentation rates follow infection with *Trypanosoma congolense* and *T. brucei*, but the increase is small in cattle, slightly greater in sheep, and very much more marked in donkeys' blood.

Tuberculosis in wild voles, A. Q. WELLS (*Lancet* [*London*], 1937, I, No. 21, p. 1221).—An examination of voles (*Microtus agrestis*), both dead and alive, from areas in Scotland, Wales, and England which are uncultivated and fenced off from domestic animals has shown that there is a widespread occurrence of tuberculosis among them and that this is not a chance infection.

The paths of infection in udder tuberculosis, H. L. TORRANCE (*Vet. Rec.*, 49 (1937), No. 46, pp. 1441–1445).—This contribution, with a clinical note on the significance of the supramammary lymphatic gland in the differential diagnosis of tuberculous mastitis, includes a report of seven cases on which post-mortem examinations were conducted.

It is concluded that (1) enlargement of the supramammary lymphatic gland where the udder appears normal is almost a certain indication that the gland is tuberculous, (2) tuberculosis of the supramammary lymphatic gland can exist without involvement of the udder or the presence of tubercle bacilli in the milk, and (3) the supramammary lymphatic gland is of considerable value as an aid to the differential diagnosis of tuberculous mastitis.

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[1] Bul. Soc. Path. Exot., 17 (1924), No. 1, pp. 37, 38.

[Contributions relating to mastitis and Bang's disease] (*Milk Plant Mo., 26 (1937), No. 11, pp. 61–63*).—Abstracts of contributions on mastitis and Bang's disease presented at the 1937 convention of the International Association of Milk Dealers at Dallas, Tex., include The Composition of Milk as Affected by Mastitis, by C. H. Whitnah, W. J. Caulfield, A. C. Fay, and V. D. Foltz (p. 61) (Kans. Experiment Station); The Effect of Mastitis on the Udder and Its Product, by T. S. Sutton (pp. 61, 62) (Ohio Station); Pathological Changes in the Udder Due to Infectious Mastitis, by W. T. Miller (p. 62); and Bang's Disease—Status of Vaccination, by A. E. Wight and J. M. Buck (pp. 62, 63).

The occurrence of milk fever in the Kentucky Station herd over a period of twenty years, H. J. Metzger and H. B. Morrison (*Amer. Soc. Anim. Prod. Proc., 1936, pp. 48–52*).—In studies of milk fever conducted from 1916 to 1935, inclusive, in the Kentucky Experiment Station herd, which consisted of a total of 218 cows of breeding age (148 Jerseys, 49 Holsteins, 17 Guernseys, and 4 crossbreds), data were obtained on its occurrence in relation to the number of calves produced by the cows and with respect to breed and the distribution of milk-fever cases by months, the details being presented in tables.

Some of the cows became susceptible to milk fever with the second calf, and this susceptibility apparently increased up to the fifth or sixth calf. The initial cases continued to appear up to the eleventh calf. Many of the cows showed a tendency to have more than one case of milk fever, this being more marked in the Jerseys. While milk fever occurred in a few cases which were not high producers, the average production of the milk-fever cows was well above the herd average. The average annual production of the Jerseys which had milk fever was 357 lb. of butterfat as compared with 316 lb. for those which had not had it, and in the Holsteins, 398 as compared with 337 lb. The annual occurrence of milk fever varied from one to five cases. At least one cow was affected each year. It is thought that some of this variation in the number of cases may be due to a lack of rainfall, through its influence on the quality of the roughage.

The relation of the accompanying hypocalcemia as influenced by the quality of the roughage and the reduction in the available ultraviolet rays resulting from city smoke during the winter months to the considerable increase in the number of cases during January, February, March, and April is considered.

The value of the whole-blood phagocytosis test as a means of determining reactivity to Brucella infection in cattle, F. W. Priestley (*Vet. Rec., 49 (1937), No. 42, pp. 1315–1321, fig. 1*).—In the course of the studies reported, 278 animals, distributed over 7 farms where vaccination experiments were in progress, were examined for the so-called opsonocytophagic power of their blood toward *B. abortus*. "These included vaccinated and nonvaccinated animals of varying ages and with varying agglutinin titers. It is shown that counts on the same smear of the polymorphonuclear leucocytes showing phagocytosis of *B. abortus* may vary by as much as 80 percent. Further, among this series it is shown that (1) age is an unimportant complicating factor, (2) the degree of phagocytosis in the nonvaccinated animals is related to titer, probably in a nonlinear fashion, being greater on the whole in low-titer than in high-titer animals, and (3) nonvaccinated animals show a higher phagocytic activity than do vaccinated animals."

The author's findings are at variance with the conclusion of Huddleson et al. (E. S. R., 75, p. 843; 77, p. 394) that phagocytosis of *B. abortus* by polymorphonuclear leucocytes may be used as a means of detecting susceptible and resistant animals.

Toxicity of arrowgrass for sheep and remedial treatment, A. B. CLAWSON and E. A. MORAN (*U. S. Dept. Agr., Tech. Bul. 580* (*1937*), *pp. 16*).—This report of work, conducted in continuation of that by Marsh, Clawson, and Roe (E. S. R., 62, p. 74), deals with feeding experiments with healthy sheep at the Bureau of Animal Industry field station at Salina, Utah, from 1934 to 1936.

In the collection of arrowgrass (*Triglochin maritima*) it was found that plants which have become established may remain healthy and grow under conditions of extreme drought or in areas covered by 3 ft. of water. The green portions of the leaves were found to be much more poisonous than the leaf bases or the stems, flowers, or fruit. The leaves of plants which make their growth during extreme drought were shown to be much more toxic than previously published reports have indicated. "When moderate quantities of moisture are available during the growth of the leaves they are somewhat less poisonous than when they have grown under drought conditions. When plants have made a portion of their growth in standing water and the remainder after the water has receded and the soil has become more or less dry, the degree of toxicity of the leaves depends on the proportion of their growth that has been made under the different conditions. Those leaves used in the present experiments were about one-fifth as poisonous as those grown under drought conditions. Leaves that have made their entire growth in standing water from 5 in. to 3 ft. deep are only slightly poisonous. As compared with leaves grown in very dry areas they are from one-fifth to less than one-tenth as toxic. Under given moisture conditions during the growth period of the plant, the age of the leaves apparently has no effect on their toxicity. There is no evidence that when grown under similar moisture conditions second-growth leaves are more poisonous than those of the first growth. Drying the leaves in direct sunlight or in the shade does not, as a rule, promptly reduce their toxicity for sheep. Leaves so dried, when fed within a month after being collected, are approximately as poisonons as when collected. After being kept for 6 mo. in an air-dry condition they still have from one-half to one-fourth of their original toxicity. In these experiments there is no evidence of any increase in toxicity associated with drying. . . .

"Sheep poisoned by arrowgrass may be benefited, and in many cases death prevented, by intraperitoneal injections of 1 g of sodium nitrite and 2 g of sodium thiosulfate in 20-percent water solution. However, if more than 1.4 lethal doses of the plant have been consumed or the symptoms have developed too far before the remedy is administered the chances of recovery are greatly reduced."

Toxicity of bitterweed (Actinea odorata) for sheep, I. B. BOUGHTON and W. T. HARDY (*Texas Sta. Bul. 552* (*1937*), *pp. 15*).—Further feeding tests conducted at the station (E. S. R., 66, p. 273) have shown that during a year of normal rainfall and range vegetation an amount of fresh green seedling bitterweed equal to approximately 1.3 percent of the body weight of sheep may be fatal when consumed at one feeding, and is the minimum lethal dose. During the drought year of 1934 the minimum lethal dose was much lower, approaching 0.5 percent of the animal's body weight. Feeding tests with bitterweed of different ages, 3 to 7 mo., indicate that there is some increase in toxicity as the weed matures. Since there is considerable variation in the susceptibility of different sheep to the weed, however, it is difficult to measure such increase. The state of nutrition in healthy yearling sheep apparently has little, if any, effect on the animal's susceptibility to bitterweed poisoning. Animals both on fattening and less-than-maintenance rations succumbed to poisoning after ingesting about the same amounts of the weed. The poisoning resulting from eating

bitterweed is cumulative in type. There is a definite correlation between the amount of weed eaten and the time of the appearance of symptoms.

Dermacentor silvarum, vector of blood parasites of sheep: Anaplasma ovis and Theileria recondita [trans. title], E. Rastégaieff (*Bul. Soc. Path. Exot., 30 (1937), No. 6, pp. 479, 480*).—The author reports finding the tick *D. silvarum* to be a vector of *A. ovis* and *T. recondita* in the Ukraine, the transmission taking place through adults of the second generation that have issued from eggs of infected ticks.

Treatment of contagious agalactia in the goat with urotropine [trans. title], A. Grimpret (*Bul. Soc. Path. Exot., 30 (1937), No. 2, pp. 122–124*).—Subcutaneous administration of 4 cc of a 10 percent solution of urotropine on 4 successive days is said to be the approved treatment for contagious agalactia of the goat, which occurs frequently in the mountain regions of Morocco in enzootic or epizootic form. By the seventh day following commencement of the treatment, the milk secretion becomes normal in both quality and quantity. In animals whose mammary symptoms are accompanied by arthritis or articular symptoms which are not relieved, a second course of 4 days' treatment should be administered after an interval of 8 days. Such animals are usually cured after 1 mo. It has been found that 2 percent of the goats with arthritis due to contagious agalactia are incurable.

Cysticercosis in deer, J. D. Gregson (*Parasitology, 29 (1937), No. 3, p. 409*).—Report is made of a 2-year-old mule deer (*Odocoileus hemionus*) that succumbed to a heavy infestation of *Cysticercus tenuicollis*.

Swine balantidiasis, J. D. Ray (*Vet. Med., 32 (1937), No. 9, pp. 392–396*).—It is concluded that *Balantidium coli* infection in swine can be prevented by proper feeding. A milk diet is said to have been used with apparently good results in herds without other treatment.

Brachylaemus suis Balozet 1936, an intestinal trematode of swine: Its pathogenicity and life cycle [trans. title], L. Balozet (*Arch. Inst. Pasteur Tunis, 26 (1937), No. 1, pp. 36–37, pls. 2, figs. 13*).—This is a report of studies of the fluke previously described by the author (E. S. R., 75, p. 401) which is important as a parasite of swine in Tunisia.

The life cycle of Brachylaemus suis [trans. title], L. Balozet (*Compt. Rend. Acad. Sci.* [*Paris*], *204 (1937), No. 8, pp. 622–624*).—Further observations and experiments with *B. suis* are noted. Snails of the genus *Xerophila* and a stenogyrid, *Rumina decollata* L., which occur widespread in North Africa, have been found to act as intermediate hosts.

Immunological relationship between the swine and human influenza viruses in swine, R. E. Shope (*Jour. Expt. Med., 66 (1937), No. 2, pp. 151–168*).—In continuation of earlier studies (E. S. R., 75, p. 847; 76, p. 395) the author has found that swine recovered from infection with either swine influenza or swine influenza virus alone are usually not only immune but refractory to human influenza infection. Swine recovered from infection with a mixture of human influenza virus and *Hemophilus influenzae suis* are usually immune to swine influenza, while those recovered from infection with human influenza virus alone are usually not immune to swine influenza. The possible mechanisms involved in the cross-immunity between the influenza viruses are discussed.

The effect of Hemophilus influenzae suis vaccines on swine influenza, R. E. Shope (*Jour. Expt. Med., 66 (1937), No. 2, pp. 169–175*).—It was found that either living or heat-killed *H. influenzae suis* vaccines, given intramuscularly to swine, elicit an immune response capable of modifying the course of a later swine influenza infection. The protection afforded is only partial and is in no

way comparable to the complete immunity afforded by swine influenza virus vaccines.

Pneumonia in swine resulting from Salmonella suipestifer infection, C. N. McBryde (*North Amer. Vet., 18 (1937), No. 6, pp. 41-47*).—Report is made of a study of a heavy loss in young pigs which occurred during an unusually severe winter at a large garbage-feeding ranch in southern California, and which it was feared might be due to hog cholera resulting from so-called "breaks" in immunity following serum simultaneous inoculation.

Filtration experiments and bacteriological studies conducted have shown that the mortality was due chiefly to infection with *S. suipestifer*, which apparently caused pneumonia as well as enteritis. "The factors chiefly responsible for the loss were a lowering of resistance resulting from inadequate protection and insufficient bedding during unusually cold and wet weather. Recent vaccination and confinement in contaminated lots were also contributory factors. Attention is directed to the finding of *S. suipestifer* in pure culture in the lungs of 7 out of 13 pigs which exhibited lesions of pneumonia, as a review of the literature reveals few published cases in which this organism has been connected with pneumonia in swine."

The nomenclature of Trypanosoma suis [trans. title], J. Schwetz (*Bul. Soc. Path. Exot., 30 (1937), No. 6, pp. 501-511*).—The author concludes that *T. simiae* Bruce et al. 1912, *T. rodhaini* Walravens 1923, and *T. porci* Schwetz 1932 are synonyms of *T. suis* Ochmann 1905, the cause of virulent trypanosomiasis of swine.

Brucella abortus in the horse, H. M. Duff (*Jour. Compar. Path. and Ther., 50 (1937), No. 3, pp. 151-158*).—In the course of bacteriological examination of samples of blood and of blood and abscess contents from numerous cases of fistulous withers and poll evil, 80 percent of the material from unopened lesions that varied in age from 1 week to over 1 yr. contained *B. abortus*. Ninety-two percent of the horses in the first series, which consisted of 85 horses showing unruptured lesions, and 87 percent of those in the second series, which consisted of 91 horses showing ruptured lesions, had been in contact with cattle. Seventy-one percent of the treated cases were reported to have recovered as a result of inoculation with a *B. abortus* dead vaccine, with or without operation.

Ultrafiltration of virus of equine encephalomyelitis (Russian strain, Moscow No. 2), A. S. Lazarus and B. F. Howitt (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 595, 596*).—A comparison was made of the particle size of the Russian strain of the equine encephalomyelitis virus with the eastern and western strains occurring in the United States. The Russian virus was found to have a particle size of from 85 to 130 mμ when using the W. J. Elford type of graded collodion membranes and the Elford correction factor. Under the same filtration conditions, the California and New Jersey strains were found to have a particle size less than 40 mμ.

Studies on the relation of streptococci to the etiology of equine encephalomyelitis.—Preliminary report, E. C. Rosenow and C. F. Schlotthauer (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 12 (1937), No. 40, pp. 631-636, figs. 3*).—A bacteriological study was made in 1934 of the brains of three horses that had died of equine encephalomyelitis in Minnesota and one in Nebraska, from each of which a streptococcus that had neurotropic virulence and cataphoretic velocity was isolated. With three of the brains, in each of which diplococci were demonstrated microscopically in typical lesions in sections, virus takes were obtained with suspensions and filtrates of suspensions of the brain in rabbits and mice. One strain was passed successively through three, one through four, and one through five series of animals. From

the emulsions of the brains of many of these animals and in some instances from filtrates of brain emulsions the streptococcus was isolated.

During the epidemic in 1937 a study was made to determine the importance of the streptococcus in relation to the etiology, prevention, and cure of this virus disease. All three horses that were injected with the encephalitis antistreptococcus serum that had been produced by repeated injection of streptococci from encephalitis in humans were greatly improved the following day. An encephalitis antistreptococcus serum prepared with streptococci from human patients was used in the treatment of horses, and an emergency vaccine prepared from streptococci isolated from the blood and brain of horses which were afflicted with or which had died of encephalomyelitis was used for the prevention of the disease.

"All veterinarians who have used the encephalitis antistreptococcus serum intravenously for treatment, in doses of from 60 to 240 cc in hypertonic (20 percent) sucrose solution, and all who have used for prophylaxis the vaccine containing from 4 to 8 billion heat-killed (70° to 75° C. for 1 hr.) streptococci per cubic centimeter, in doses of 1, 2, and 3 cc, given subcutaneously, 1 to 3 days apart, are enthusiastic over the results obtained. The vaccine is prepared from freshly isolated strains from blood and brain preserved in very dense suspension in glycerin (2 parts) and 25 percent sodium chloride solution (1 part). Each cubic centimeter of this menstruum is made to contain the growth from 1 l of dextrose broth. In making the vaccine appropriate dilutions are made from this suspension."

It is concluded that the frequent occurrence of *Bacillus subtilis* together with the streptococcus in cultures obtained from blood and brain is not always due to contamination. Transition forms of these were commonly seen in smears. Pleomorphic diplococci or streptococci, and bacilli, were often found in the same chain in primary cultures and unmistakable small diplococci were often seen within swollen, Gram-positive bacilli.

It is pointed out that the close antigenic relation of the streptococcus obtained from equine encephalomyelitis to the streptococcus isolated in studies of encephalitis and poliomyelitis of human beings is shown by the fact that the precipitin reaction as well as the blood cultures often became suddenly negative following administration of the antistreptococcus serum. Moreover, most of the strains of streptococci isolated from the nose, blood, and brain of horses that had encephalomyelitis, as some of those isolated from flies and drinking water, were agglutinated specifically by the encephalitis antistreptococcus serum prepared with streptococci obtained from persons having encephalitis.

Types of tubercle bacilli in equine tuberculosis, A. S. Griffith (*Jour. Compar. Path. and Ther., 50 (1937), No. 3, pp. 159–172*).—The tubercle bacilli cultivated from 55 cases of equine tuberculosis, the total number investigated bacteriologically in England, belonged to the bovine type in all but two instances, one of which was a strain of human type and the other a strain of avian type. "The bovine strains all exhibited the cultural characters of the more dysgonic members of the bovine type, and rather more than half of them were fully virulent for the test animals. The rest were less virulent than standard bovine bacilli for all the species of animals tested, the degree of attenuation varying from slight to considerable."

A problem and a plan relative to the study of bird diseases, C. B. Worth (*Bird-Banding, 8 (1937), No. 3, pp. 109–113*).—An outline discussion of a proposed Nation-wide survey of bird diseases to be undertaken while evidence of the assumed recent epidemic which has resulted in an almost universal scarcity of individuals is at hand.

[Contributions on avian pathology] (*Poultry Sci., 16 (1937), No. 5, pp. 345, 360–362*).—Abstracts are given of contributions presented at the annual meeting of the Poultry Science Association held at Madison, Wis., in August 1937, as follows: The Recovery of Laying Pullets From Cecal Coccidiosis as Affected by Feeding Varying Amounts of Cod Liver Oil, by R. R. Murphy, J. E. Hunter, and H. C. Knandel (p. 345); Susceptibility and Resistance of Some Strains of Chickens to Fowl Leucosis, by H. L. Wilcke, C. D. Lee, and C. Murray (p. 360); Experiments in the Transmission of Fowl Paralysis by Inoculation, by J. R. Beach (pp. 360, 361); Relationship Between Colon Bacilli and Cecal Coccidiosis in the Production of Chronic Coccidiosis, by G. L. Ott (p. 361); Feeding Sulphur to Control Coccidiosis in Poultry, by C. A. Herrick and C. E. Holmes (p. 361) (E. S. R., 76, p. 856); Short Interval Testing for the Eradication of Pullorum, by C. A. Bottorff (p. 361) (N. H. Experiment Station); and A Modified Pigeon-Pox Vaccine-Virus for Fowl-Pox Immunization, by R. E. Lubbehusen (pp. 361, 362).

Notes on avian coccidiosis, D. C. BOUGHTON (*Auk, 54 (1937), No. 4, pp. 500–509, pl. 1*).—After calling attention to two types of avian coccidia represented by the genera *Isospora* and *Eimeria*, coccidiosis of small birds and the examination and sources of bird hosts are considered. The distribution of coccidia among birds is then reviewed, mention being made of those orders for which coccidia have not been reported. A list is given of 26 references to the literature.

Studies in coccidiosis in chickens: Calcium carbonate additions and coccidia, C. E. HOLMES, C. A. HERRICK, and G. L. OTT (*Poultry Sci., 16 (1937), No. 5, pp. 335–339*).—In further work at the Wisconsin Experiment Station (E. S. R., 76, p. 696) more deaths occurred in two of three trials after infection with coccidiosis when "6 percent of chick size oystershell was added to a basal diet containing 0.8714 and 0.9343 percent calcium and phosphorus, respectively. The results of the three trials indicate that with the higher levels of calcium carbonate more deaths occurred after infection with coccidiosis. Attempts to determine the effects of different levels of calcium carbonate on mortality from coccidiosis, holding the calcium to phosphorus ratio constant by means of disodium phosphate, were not successful, due probably to unpalatability of the rations containing this phosphorus supplement."

Variations in fowl-pest virus, R. D. MACKENZIE and G. M. FINDLAY (*Brit. Jour. Expt. Path., 18 (1937), No. 2, pp. 138–145*).—Through intracerebral passage in passively immunized canaries a variant of the fowl pest virus was produced. Intracerebral passage of this canary variant in mice has led to the formation of a mouse variant. These two variants and the original or starting strain can be differentiated from each other by their pathogenic effects in mice. Both variants and the original strain are antigenically related.

The transmission of fowl pest to ferrets, G. M. FINDLAY and R. D. MACKENZIE (*Brit. Jour. Expt. Path., 18 (1937), No. 2, pp. 146–155, figs. 4*).—It is shown that the ferret and fitch are highly susceptible to the virus of fowl pest. One strain of fowl pest killed ferrets on intracerebral and intraperitoneal inoculation as well as on intranasal instillation; a second failed to kill on intraperitoneal inoculation, but killed after intracerebral inoculation and intranasal instillation; another strain failed to kill, but produced a febrile reaction on intracerebral inoculation. The pathogenicity of fowl pest strains for ferrets paralleled their pathogenicity for mice. All four strains produced cross immunity in ferrets. The clinical symptoms produced in ferrets by the fowl pest virus were those of an ascending myelitis. At autopsy there were also found bronchopneumonia and lesions of the liver, kidney, and stomach. No relationship could

be found between the virus of fowl pest and other viruses—canine distemper, influenza, and Rift Valley fever—which induce bronchopneumonia in ferrets. The pig inoculated intranasally with fowl pest virus exhibits no reaction but develops immune bodies; inoculated intracerebrally it develops a short febrile reaction.

Attempts at cultivation of viruses producing leukosis in fowls, J. Furth and C. Breedis (*Arch. Path., 24 (1937), No. 3, pp. 281–302, figs. 6*).—In the studies conducted the authors found that "leukemic myeloblasts of chickens (virus 1) remain viable in vitro in liquid cultures for at least 30 days and produce leucosis when inoculated into chickens. In solid cultures of spleen and bone marrow from chickens with myeloid leukemia a symbiotic growth of myeloblasts and fibroblastlike cells occurs. These cultures likewise have the ability to produce leucosis. Fibroblastlike cultures of bone marrow of a chicken with erythroleucosis, not containing leucotic blood cells, failed to produce leucosis.

"The leucotic virus 2 survives in vitro for at least 36 days in the presence of cells resembling neoplastic endothelium produced in vivo by this virus. Osteochondrosarcoma produced by virus 12 when grown in vitro yields fibroblastlike cells. Inoculation of these cells into chickens after 91 days of cultivation produced both osteochondrosarcoma and leucosis. Virus 12 produces both osteochondrosarcoma and leucosis. Cultures of sarcoma produced by virus 13 grown in vitro for 158 days and free from blood cells produced both sarcoma and leucosis. This observation supports the view that virus 13 stimulates both primitive blood cells and mesenchymal cells other than blood cells. Virus 13 perishes in vitro within approximately 2 weeks in the presence of normal fibroblastic cells of spleen and of embryonal leg. Virus 1, which produces leucosis, perishes in the presence of sarcoma cells produced by a virus that does not stimulate primitive blood cells.

"These experiments support the opinion that oncogenic viruses multiply in vitro only in the presence of cells on which they confer neoplastic properties. They indicate that a single virus may stimulate both primitive blood cells and fibroblastlike cells. The different viruses studied retained their characteristics during a period of observation of from 3 to 5 yr."

Experimental study of Plasmodium gallinaceum, a parasite of the domestic fowl [trans. title], E. Brumpt (*Ann. Parasitol. Humaine et Compar., 14 (1936), No. 6, pp. 597–620, figs. 10*).—In the course of transmission studies with a strain of *P. gallinaceum* (E. S. R., 73, p. 394) originating in Ceylon, the details of which are given in a table of nine pages, it was found to develop rapidly in 100 percent of the yellow-fever mosquitoes infected and equally so in *Stegomyia albopicta* (=*S. variegata*), by which it is transmitted. *Culex fatigans* did not transmit the infection even when fed in large numbers on diseased fowl, neither did the northern house mosquito.

Pullorum disease eradication making progress, H. Van Roekel (*New England Poultryman and Northeast. Breeder, 25 (1937), No. 4, pp. 14, 15*).—This contribution from the Massachusetts Experiment Station includes a summary of the 10-yr. pullorum testing work in Massachusetts and a pullorum testing summary of work in the New England States during 1936–37.

A note on a variety of Salmonella enteritidis isolated from pigeons, J. F. Shirlaw and S. G. Iyer (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 3, pp. 231–242, pl. 1, figs. 2*).—In a batch of pigeons inoculated with experimental pigeon pox virus at the Imperial Veterinary Research Institute at Mukteswar, deaths from a septicemic disease occurred, and from the heart blood of such pigeons a Gram-negative bacterium was isolated.

A note on the incidence of Syngamus trachea in turkeys, with observations on nodules caused by this parasite, E. E. Wehr (*Poultry Sci., 16 (1937), No. 5, pp. 331–334*).—An examination was made of the tracheae of 936 turkeys collected at a poultry market in Washington, D. C., in November and December 1936. The age of most, if not all, of these birds is believed to have been under 1 yr. and probably not over 9 mo. The percentage of infestation was found to be approximately 14.7 percent, or about 7.8 percent lower than that reported by Ransom in 1921 for the same territory (E. S. R., 45, p. 77). The lower percentage of infestation determined for 1936 is thought to indicate that gapeworms in turkeys have become a less serious problem to the poultryman.

AGRICULTURAL ENGINEERING

Agricultural engineering (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 99–102*).—A brief description is given of the work of the Bureau of Agricultural Engineering as regards farm improvements, the evolution of the tractor, farm drainage, use of irrigation water, barn temperature, cotton-ginning practices, fertilizer application, a basin-forming lister, and a disk jointer.

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 352 (1937), pp. 24–26*).—Progress results are briefly presented of investigations on the efficiency of milk coolers, by J. E. Nicholas; use of tractors, by R. U. Blasingame and A. W. Clyde; artificial curing of alfalfa, by Clyde and S. I. Bechdel; harvesting potatoes and mechanics of tillage tools, both by Clyde; and precooling eggs on the farm, by Nicholas.

Ground water, C. F. Tolman (*New York and London: McGraw-Hill Book Co., 1937, pp. XVII+593, figs. 189*).—In addition to a brief historical introduction, this book contains chapters on elements of ground-water hydrology and application to ground-water litigation; rainfall, run-off, evaporation, and transpiration; hydrologic properties of water-bearing materials, except soils; the soil; occurrence of water and forces acting in the zone of aeration; influent seepage including water spreading; percolation, ground-water turbulent flow, and permeability; the water table in granular pervious material; ground-water in fractures and solution openings; confined water; geological classification of artesian aquifers; wells; oil field fluids; springs; the ground-water inventory; and ground-water provinces of the United States and Hawaiian Islands. The preface states that "this book is the first general treatise of the science published in English and the only one to attempt a summary of the results of the intensive study of subsurface water in western United States, where existence depends upon the exploration and development of ground water."

Geology and ground-water resources of Webb County, Texas, J. T. Lonsdale and J. R. Day (*U. S. Geol. Survey, Water-Supply Paper 778 (1937), pp. V+104, pls. 12, figs. 6*).—This is a report of an investigation made in cooperation with the Texas Board of Water Engineers and the Engineering Experiment Station of the A. and M. College of Texas. It is intended to serve as a practical guide to the ground-water resources of the county, with special reference to the supply of ground water available for irrigation.

The warm springs of Georgia: Their geologic relations and origin, D. F. Hewett and G. W. Crickmay (*U. S. Geol. Survey, Water-Supply Paper 819 (1937), pp. IV+40, pls. 8, fig. 1*).—This preliminary report, prepared in cooperation with the Georgia Department of Forestry and Geological Development, presents briefly the geologic relations and origin of the known warm springs of Georgia, found in a belt that extends from Barnesville southwestward about

40 miles to Warm Springs. The investigation included a study of the distribution, environment, discharge, chemical character, and temperature of the spring waters of the region; and, because of their bearing on the probable source of spring waters, it also included measurements of the local rainfall and of water levels in selected wells and determinations of the distribution of the run-off of the streams from an area of 32 sq. miles on Pine Mountain near Warm Springs.

Soil conservation districts for erosion control (*U. S. Dept. Agr., Misc. Pub. 293 (1937), pp. 19, figs. 7*).—The purpose of this publication is to show how the Soil Conservation Service may cooperate with farmers through mechanism provided by State legislation covering soil conservation districts.

Design and construction of the drop inlet soil-saving dam, compiled by C. L. Hamilton et al. (*U. S. Dept. Agr., Soil Conserv. Serv., 1937, SCS-EP-14, pp. [6]+32, pls. 25, fig. 1*).—This is a joint contribution of the Soil Conservation Service and the University of Wisconsin. It deals with the drop inlet soil-saving dam and reports this work in technical detail.

The Nichols terrace: An improved channel-type terrace for the Southeast, J. J. Henry in collab. with M. L. Nichols (*U. S. Dept. Agr., Farmers' Bul. 1790 (1937), pp. II+13, figs. 11*).—The Nichols terrace, here described, is characterized as a major contribution to agriculture, being widely accepted in the Southeast as the most effective means of erosion control.

The Nichols terrace is not a terrace in the true sense of the word. It is instead a shallow waterway which conducts run-off water slowly from cultivated fields. The terrace feature is built entirely from the upper side so that soil is moved only down hill. A shallow, broad channel is cut down into the soil or often into the subsoil below the natural level of the field. This broad channel spreads the water and thereby reduces its power to carry away the soil and overcomes the most serious objection to the hillside ditch. No effort is made to maintain the distinct terrace ridge, the ridge being blended into the slope after the field is worked. Information is given on the best methods of constructing the Nichols terrace.

Public Roads, [December 1937] (*U. S. Dept. Agr., Public Roads, 18 (1937), No. 10, pp. [2]+185-200+[1], figs. 22*).—This number of this periodical contains data on the current status of various highway projects receiving Federal funds as of November 30, 1937, and the following articles: A Machine for Impact and Sustained Load Tests of Concrete (pp. 185-194) and Determination of Variation in Unit Pressure Over the Contact Area of Tires (pp. 195-198), both by L. W. Teller and J. A. Buchanan.

Federal highway programs (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 112-115*).—A brief statement is presented covering the progress of the Bureau of Public Roads in the elimination of grade crossings, large-scale highway planning, and highway construction.

Guides to traffic safety (*U. S. Dept. Agr., Bur. Pub. Roads, 1937, pp. III+31*).—This report, prepared by the Executive Committee of the National Conference on State and Highway Safety, outlines methods suggested by experience for dealing with current pressing problems of street and highway safety.

A seed dropper for cereal nursery rows, L. C. Burnett (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 419, 420, fig. 1*).—In a contribution from the Iowa Experiment Station a seed dropper is described which has been adapted from the chain-drive model planter. The tool consists of a belt operating in the bottom of a trough with an adjustable gate that may be set for different row lengths.

The development of a flotation process for the cleaning of clover seeds, F. C. Dyer and H. L. McClelland (*Sci. Agr., 18 (1937), No. 2, pp. 90-101, figs.*

36).—In studies conducted at the University of Toronto the film flotation process seemed to be the most promising cleaning process, and this method was developed finally into a commercial means of freeing clover seed from the seed of bladder campion, night-flowering catchfly, and white cockle. Subsequently dodder and other weed seeds were added to the list.

The experiments showed that there are differences previously unknown in the wettability of the coats of seeds. The difference in some cases is sufficient to allow a good separation using a water bath alone. It is possible to increase the wettability of some seeds more than of others by the use of the proper reagent and to decrease the wettability of others. The difference in wettability may be increased to such an extent as to make separation difficult by other means comparatively easy by flotation methods. Successful separation has been made from clover of bladder campion, night-flowering catchfly, white cockle, and dodder, and the principle may be capable of extension to other weed seeds.

Building and remodeling dairy barns, C. S. Rhode and W. A. Foster (*Illinois Sta. Circ. 478* (*1937*), *pp. 27+[1]*, *figs. 15*).—Practical technical information is given on the subject, together with working drawings and special features.

Investigation of summer cooling in the warm-air heating research residence, A. P. Kratz, M. K. Fahnestock, and S. Konzo (*Ill. Engin. Expt. Sta. Bul. 290* (*1937*), *pp. 140*, *figs. 39*).—This bulletin contains the results obtained during three summer seasons.

Tests on cooling with ice showed that the ducts and registers of a central forced-air heating system can be successfully adapted as a distributing system for cooled air in the summertime without material alterations. There is no tendency for a pool of cold air to collect near the floor if the temperature of the air entering the room through the registers is not lower than 60° F. Baseboard registers can be used without objectionable drafts resulting if the velocity of the air at the register face is below 300 ft. per minute, although wall registers located 7 ft. above the floor are preferable to baseboard registers with perforated grilles. A two-story building of the type of the research residence may require the equivalent of 2 tons of ice in 24 hr., including the basement load, on days when the maximum outdoor temperature reaches 100°, if an effective temperature of approximately 73° is maintained indoors. The use of awnings at all windows on east, south, and west exposures may result in savings of from 20 to 30 percent in the required cooling load. The cooling load per degree difference in temperature is not constant, but increases as the outdoor temperature increases. The heat lag of the building complicates the estimation of the cooling load under any specified conditions, and makes such estimates based on the usual methods of computation of doubtful value.

The circulation of air from the outdoors at night, when used as a supplement to artificial cooling during the day, has considerable merit in reducing the seasonal cooling load that would otherwise be required, and may make the use of artificial cooling unnecessary for a considerable portion of the summer season. The most effective method of circulating air from the outdoors at night is to open all of the windows and to use a fan drawing the equivalent of approximately 17 air changes per hour into the windows of the first and second stories and discharging the air into the attic to escape from the attic windows. Satisfactory cooling with outdoor air at night probably cannot be accomplished by employing less than 9 air changes per hour, but the gain arising from the use of more than 30 air changes per hour is very small. There is some advantage in opening the windows at 6 p. m. rather than 9 p. m., even if the outdoor temperature is slightly higher than the indoor temperature at 6 p. m.

In tests on cooling with mechanical refrigeration an indoor temperature of approximately 80° with relative humidity below 55 percent resulted in satisfactory comfort conditions in the living quarters of a residence. For complete comfort in sleeping quarters a somewhat lower temperature is desirable. The introduction of approximately one air change per hour of outdoor air for the purpose of ventilation is sufficient to prevent objectionable odors. A mechanical refrigeration unit capable of producing 2½ tons of refrigeration is sufficient to maintain conditions of comfort on two stories of a residence similar to the research residence when the outdoor temperature does not exceed 103° and an amount of outdoor air equivalent to one air change per hour is used for the purpose of ventilation. The cooling load during the daytime can be reduced by supplementing artificial cooling during the day with cooling by means of outdoor air circulated at night.

Room-cooling units should be operated and controlled to maintain a constant dry-bulb temperature in the room rather than to maintain a complex schedule of indoor temperatures varying with the outdoor temperature. A room-cooling unit of 300 lb. ice capacity and having a melting rate of approximately 20 lb. of ice per hour would be adequate to satisfy the normal cooling requirements of a medium-sized first-story room of a residence for most summer days, if no outdoor air other than that which enters by natural infiltration is introduced for ventilation. However, if the occupancy of the room is to be more than two persons it is essential that additional capacity be supplied for the necessary ventilation required to reduce undesirable odors.

The initial ice melting rate, or the melting rate during the first hour after the unit was started, was nearly twice as great as the normal melting rate. Of the total amount of heat absorbed by the room-cooling units, approximately from 16 to 38 percent was absorbed in the dehumidification process. In addition to the lowering of the dry-bulb temperature the relative humidity of the air in the rooms was, in most cases, reduced about 15 points after 3 or more hours of continuous operation of the units. Although not centrally located on the first story of the residence, the cooling units operated in the living room effectively cooled and dehumidified the air in the adjoining rooms, and there was some indication that the reduction in relative humidity extended to the second story.

AGRICULTURAL ECONOMICS

A formula for reducing the computations necessary to find the variance of a set of averages, W. D. Baten (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 8*, *pp. 575–580*).—In this contribution from the Michigan Experiment Station, formulas are derived which "enable one to find the mean and the standard deviation of a set of averages without actually finding the averages or the deviations from the general mean and by employing smaller numbers than the original measurements. These formulas reduce the work of computation."

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 189* (*1937*), *pp. 163–165*, *fig. 1*).—A chart by H. R. Moore shows the relation of farm products prices and land values in Ohio, 1880–1936. The index numbers of production, prices, and income (E. S. R., 78, p. 409) are brought down through August 1937 by J. I. Falconer.

[Investigations in agricultural economics by the Puerto Rico Station, 1936] (*Puerto Rico Sta. Rpt. 1936*, *pp. 9–16*, *55–61*, *fig. 1*).—The climatic and marketing factors in relation to land utilization are described, special attention being given to the possibilities for bamboos, palm chestnuts, and vanilla in the mountainous areas, and for truck crops for winter marketing in New

York City, pineapples, mangoes, pastures, etc., on the northern coast. The possibilities for markets for winter-grown vegetables in the continental United States and factors limiting such marketing are discussed, and the results given of some experimental shipments of limes that had been carefully picked, graded, and wrapped and packed and of sweet corn carefully graded, packed, and iced in the field. Both experiments gave encouraging results.

[**The agricultural situation, 1937**] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 1–41, 44–67, 68–76, 98, 99*).—This report of the Secretary of Agriculture to President Roosevelt is planned "to emphasize certain principles that 5 yr. of agricultural and industrial recovery has clarified and demonstrated" rather than to give particulars of the year's production and of farm prices and farm income. The relationship of farm and factory, the influence of city wage rates, the need for rural-urban balance in production, adjustments in industry, intergroup cooperation, farm objectives that harmonize with the general welfare, new needs of our maturing economic system, etc., are discussed. The principles and major requirements of crop adjustment and the problems and requirements of cotton, wheat, and other crops are described. The national conservation program is outlined. The foreign trade of the United States, the debtor-creditor position of the United States, the outlook for farm exports, the significance of trade agreements, etc., are discussed. The requirements in land planning, the main aims, effects on farm land values, insecurity of tenants and owners, etc.; the land programs under way, including the farm tenant act, the water utilization plan, and State legislation; land treatment for flood control; the Soil Conservation Service; and farm labor, including trends of wages, living standards, labor clauses in marketing agreements, etc., are also discussed. A brief analysis is made of the conditions existing and changes since the beginning of the depression in farm income, farm credit, and farm production in the leading crops, and of the crop shifts since the war. Costs of marketing and grading and standardization are also discussed. The Commodity Exchange Act and its operation and some rulings and court decisions under the Packers and Stockyards Act are described.

The farm outlook for 1938 (*U. S. Dept. Agr., Misc. Pub. 298 (1937), pp. IV+43, figs. 12*).—This publication, prepared by the Bureau of Agricultural Economics in cooperation with representatives of the State agricultural colleges, includes facts and information to assist farmers in planning their 1938 operations. The general outlook as regards domestic and foreign demand for farm products, the general price level, farm credit, farm labor, building materials, farm machinery, fertilizers, and farm family living is discussed. More detailed analysis is made of the outlook for cotton, wheat, tobacco, fruits, truck crops for market and canning, sweetpotatoes, potatoes, rice, flaxseed, soybeans, clover and alfalfa seed, peanuts, dry beans, tree nuts, feed grains, corn, oats, millfeeds, hay, hogs, beef cattle, sheep and lambs, wool, mohair, dairy products, chickens and eggs, turkeys, and horses and mules.

A graphic summary of the number, size, and type of farm, and value of products (based largely on the census of 1930 and 1935), O. E. Baker (*U. S. Dept. Agr., Misc. Pub. 266 (1937), pp. [2]+76, figs. 106*).—This publication is one of the series previously described (E. S. R., 77, p. 117).

A statistical study of agricultural and related trends in South Carolina, J. L. Fulmer (*South Carolina Sta. Bul. 312 (1937), pp. 72, figs. 27*).—"The purposes of this study are to determine (1) the economic changes in the acreage, yield, and production of important crops; (2) shifts in the numbers of important classes of livestock; (3) the relationship between trends in crops and livestock enterprises and such local factors as weather, farm prices, fertilizer

sales, number of farms, size of farms, population, and cotton mill activity; and (4) by comparison, the relationship between State, national, and international trends in the acreage of cotton and tobacco." Tables and charts are included and discussed showing for cotton, tobacco, corn, oats, hay, wheat, sweetpotatoes, potatoes, and the eight crops combined the general trends and yearly variations in acreages, yields, and production, 1902–36, inclusive, and for horses, mules, hogs, cows and heifers, and sheep the numbers on farms and trends from January 1, 1902 to January 1936, inclusive. The climatic conditions influencing the agriculture of the State are discussed. Charts with discussion show the relationship, 1902–36, of seasonal wholesale prices of all commodities in the United States and the farm prices of the seven major crops and of cotton and cottonseed in the State; the relationship, 1902–35, of cost factors in cotton production in the United States and farm prices of cotton and cottonseed in the State; and the relationship, 1902–35, of purchasing power of the total farm value of cotton and cottonseed and acreage of cotton harvested the following year in the State.

The production of cotton increased rapidly to 1920 then declined 53 percent in 1921, with a further decline in 1922, after which it increased an average of 0.4 percent each year. Corn production increased rapidly to 1917 then declined considerably to 1928, after which there was a slight recovery. Oats production increased rapidly to 1918 and very slightly thereafter. Hay production increased to about 1928 and potato production to about 1931, after which dates both dropped below normal materially. Wheat production showed a consistent decline to 1931, then a sharp recovery. The trend for tobacco was generally upward during the entire 35 yr., but after 1928 it was below the previous 3-yr. level. The composite index of production of the seven crops rose rapidly until 1920, dropped 39 percent in 1921, and fluctuated around that level for the remainder of the period studied. The number of horses increased until 1918 and the number of mules until 1921, after which dates both decreased rapidly. The number of hogs and of cows and heifers increased until 1919; hogs then decreased until 1927 and cows and heifers until 1931, after which dates both showed recovery in numbers. The number of sheep showed a downward trend throughout the 35-yr. period but the rate of decline was less after 1926. In the farm set-up cotton was emphasized until 1932, after which feed crops gained in prominence. Price relationships appeared to be the most important factor causing changes in farm enterprises. Growth of the textile industry afforded alternative employment when agriculture was in an unfavorable position. The shift was reflected first by number of people on farms and number of farms and finally by acreage of different crops and numbers of different classes of animals.

"The long-time expansion of the agricultural industry from 1902 to 1918 was caused largely by the rising price level. Since 1918 a series of events has been responsible for the curtailment of the agricultural industry. The general price level declined rapidly from 1919 to 1921 and from 1929 to 1932 but farm prices declined more. The effect of these price movements was accelerated and made more acute by the bollweevil and a decade of rainfall generally unfavorable to cotton yields. In recent years a normal response of the major agricultural enterprises to the improvement in prices was prevented by acreage control. This artificial factor was a more serious detriment than at first appears to be the case, because the effect of the bollweevil was noticeably less and also precipitation favored yields more than previously."

Foreign Agriculture, [November 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), No. 11, pp. 529–586, figs. 8*).—Included are articles on

British Imperial Preference in Relation to United States Leaf Tobacco Exports, by H. L. Franklin (pp. 531–556), and Farm Tenancy in Ireland, by A. T. Murray (pp. 557–582), and notes on recent developments in foreign agricultural policy as follows: Province of Quebec enacts sweeping marketing regulations, new German trade and payment agreement with New Zealand, and Argentine opens grain office in Europe.

The world sugar situation, 1937 (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [4]+44, pls. 6*).—World production of sugar, sugar beet acreages, consumption and stocks of sugar; United States sugar supplies, entries under the quota system, deliveries and consumption, prices, etc.; the sugar situation in Cuba; and Java sugar production are discussed. Excerpts from the article on The London Sugar Agreement by Keeler (E. S. R., 77, p. 712) are included.

Agricultural imports classified on the basis of their competitive nature and tariff status, C. F. Wells (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+30*).—The purpose of this publication "is to contribute material of a descriptive and analytical nature which will promote a better understanding of the nature of the agricultural products that are being imported into the United States and their relation to domestic agriculture."

Agricultural imports are classified in four ways: (1) Those commodities which are also produced in the United States and those which are not; (2) those commodities which compete with domestic farm products and those which do not; (3) those whose tariff status is a factor affecting the price of competitive domestic farm products; and (4) those which are free of duty and those which are dutiable. The report deals only with the direct effects of duty changes, making no attempt to analyze the many indirect effects of such duty changes on domestic agriculture and on foreign trade in agricultural products.

Tables show the percentages of imported agricultural products classified on the basis of their competitive nature that were duty-free and dutiable during the periods from 1924–25 to 1928–29, from 1929–30 to 1932–33, and 1934–35, and the quantities and value of different commodities imported during the same periods, the classification being on the basis of whether or not the commodities are also produced in the United States and whether or not they are substituted for domestic farm products.

The author states "this tentative classification of agricultural imports on the basis of the probable price effects of changes in their duties leads to the following conclusions for the 4-yr. period beginning July 1, 1929 (percentages in each class are minimums since about 8 percent of imports were not classified): (1) At least 54 percent of the agricultural imports in terms of value do not compete with domestic farm products either directly or indirectly, and therefore changes in the duties on these imports would not tend to raise or lower the price of domestic farm products appreciably. (2) At least 38 percent of the agricultural imports were competitive and were subdivided into four groups, B, C, D, and E, on the basis of the degree to which changes in their duties would affect prices of domestic agricultural products. A restriction of imports of products in group B, representing less than 1 percent of total agricultural imports, would raise prices of domestic farm products only a negligible amount. Changes in the duties on products in Class C would also have a negligible effect on the prices of the domestic farm products. Groups B and C combined represent at least 15 percent of total agricultural imports, and the domestic products with which they compete were the source of about 60 percent of cash farm income in the period mentioned. . . . (3) Changes in the duties on products in groups D, and E, representing at least 24 per-

cent of agricultural imports, would have had some effect, the extent of which is unknown, on the prices of the domestic farm products with which they compete. Products in groups D and E competed with domestic farm products from which about 25 percent of cash farm income was derived."

The farm business from 1929 to 1935 on one hundred forty-one Ohio farms, J. H. SITTERLEY and J. I. FALCONER (*Ohio Sta. Bul. 587 (1937), pp. 22, figs. 3*).—"The primary purpose of this analysis is to observe some of the effects of the radically changing conditions between 1929 and 1935 on net cash income, to record the recognizable adjustments made, and to determine, insofar as possible from the records, some of the characteristics of those farms that obtained the largest and those that obtained the smallest incomes during the period."

Tables and charts are included and discussed showing (1) by years 1921–35, inclusive, the indexes of gross cash agricultural income in Ohio and on the 141 farms in the study (1929–35) and the prices received by Ohio farmers for agricultural products and paid for factors of production, and (2) for the farms studied the average cash receipts by sources and cash expenditures by types by years 1929–35, expenses for replacements and improvements, utilization of land, crop yields and production, livestock production, etc. Comparisons are made of farms with the highest and lowest net cash incomes.

"There was no tendency between 1929 and 1935 on these farms to make major changes in farm organization other than to increase or decrease the scale of operation. Net cash income declined 50.1 percent, cash receipts 51.7 percent, and cash expenses 52.9 percent, from 1929 to the end of 1932. In 1935, net cash income was 12.8 percent, cash receipts were 19.3 percent, and cash expenses 24.2 percent below the 1929 level. The total farm acreage and acreage of crops of the 141 farms tended to increase as prices declined. More head of breeding and producing stock were on these farms at the end of 1932 than at the beginning of 1929. For the group as a whole, curtailments in expenditures by 1932 resulted in but two-thirds the quantity of feed being purchased, only slightly more than one-half the tonnage of fertilizer and lime being used, one-half the number of head of breeding and feeding stock being bought, and approximately one-third the number of farm implements being purchased, in comparison with 1929. Receipts from poultry declined the least of the major sources of livestock income, and receipts from hogs the most. Total receipts from crop sales declined the most rapidly and recovered first. The amount of hired labor remained fairly constant, but owing to the use of more family labor, the total number of men employed on these farms increased from 1.5 men per farm in 1929 to 1.9 men in 1935. The number of dollars spent for fuel and oil remained almost stationary during the 7 yr. The farms that had the highest average net cash income for the period were among the high farms in 1929. The farms that had the lowest average net cash income for the period were among the low farms in 1929. Size, volume of business, geographic location, and efficiency were the chief factors that contributed to the difference in income between the two groups. Although there were no farms among the 141 that did not have some fluctuation in yearly income, the farms in the high group had less fluctuation during the 7 yr. than did the farms in the low-income group."

The production and sale of poultry and eggs in three Rhode Island areas, A. W. MANCHESTER and H. C. FOWLER (*Rhode Island Sta. Bul. 262 (1937), pp. 31, fig. 1*).—This bulletin is based on a survey made in the spring and summer of 1936 in three areas (1) the town of Foster, a general farming district with little opportunity for local retail sales of eggs; (2) the towns of Narragansett and South Kingstown, representative of districts having a summer market at shore resorts; and (3) the town of West Warwick, typical of industrial and

suburban areas having good local retail outlets. The analysis is chiefly by areas and totals for all areas. Tables are included and discussed showing the distribution of flocks by size and of poultry by size of flocks; egg sales by method of marketing, type of flock, and season, hatching, and sale of baby chicks; and the utilization of capacity of poultry houses by type of flock. The relation of season to the method of sale and the amount of poultry not reported by the 1935 U. S. Census are discussed. Some of the findings were:

As compared with 1934, commercial flocks in 1935 had increased 21 percent, while side-line flocks had decreased 4 percent and family-supply flocks 20 percent. Fifty-five percent of the hens were in commercial flocks, 34 percent in side-line flocks, and 11 percent in family-supply flocks. Of the poultry keepers, 80.7 percent had less than 100 hens each, 14 percent between 100 and 500 hens, and 5.3 percent 500 or more. Less than 36 percent of the poultrymen hatched any chicks and 62 percent of the chicks brooded were purchased. The number of hens housed in the fall of 1935 were sufficient to use 77 percent of the housing capacity on commercial farms, and 40 and 29 percent, respectively, in the cases of side-line and family-supply flocks. Of the eggs produced in the three areas, 87 percent were sold. Of the sales, approximately 58 percent were to wholesalers or through commission firms, 30 percent were retailed, and 12 percent sold to stores. Sales directly to hotels and restaurants were only a fraction of 1 percent. Methods of marketing and yearly home consumption of eggs varied considerably in the three areas. The poultrymen, in general, did not change their marketing methods during the year. Summer retailing increased slightly in the shore towns but decreased somewhat in the other areas. Sales to stores in shore towns were 12 percent of total sales in the summer and 17 percent in the spring.

Dairy farm organization and management in southeastern Pennsylvania, T. D. Johnson and J. E. McCord (*Pennsylvania Sta. Bul. 350 (1937), pp. 82, figs. 13*).—This study, which applies to the years beginning April 1, 1930 and 1931, was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics. Records were furnished by 240 farmers during the first year and 139 of the same farmers during the second year. The study was made in the same area and upon many of the same farms covered by the studies made in 1912 and 1922 previously noted (E. S. R., 34, p. 592; 55, p. 284), and comparisons are made of the findings with those in the previous studies. In the analysis the farms were grouped as follows: (1) Dairy farms having also the mushroom enterprise, (2) dairy farms having over 15 percent of their total receipts from the poultry enterprise, (3) dairy farms with 10 cows or less, and (4) dairy farms with more than 10 cows.

Some of the findings were: Sales of livestock and livestock products were 65 percent and crop sales 33 percent of all cash receipts in 1912, as compared with 90 and 4 percent, respectively, in 1931. Average labor income per farm decreased from $845 in 1930 to $110 in 1931–32, although more efficient farming methods were used in the latter year. In 1930 the labor income averaged $1,278 on farms having over 20 cows and $228 on farms having less than 11 cows. The average labor income in 1931 was —$388 on farms where the average production of milk per cow was under 5,000 lb. In 1930 the average labor income was $1,727 on the farms having a production index of over 110 and —$116 on those with an index less than 90. The corresponding figures for 1931 were $284 and —$449. The low base quantity of milk allowed many farms tended to limit adjustments to increase farm income. With unrestricted opportunity to establish a new basic quantity of milk, a majority of the farmers could increase production considerably. Under current premiums for grade A

milk it is advantageous for producers selling grade A milk to have as high a butterfat test as possible. Producers of grade B milk received the highest prices per pound of butterfat when the milk tested relatively low. Increasing poultry production until all available labor was utilized was a relatively satisfactory method of increasing income in many cases. Among the more important factors affecting labor income were "number of cows, milk production per cow, butterfat test of milk, average price received for milk sold, purchased concentrate feeds per cow, feed cost per 100 lb. of milk sold, productive man work units per man, crop index, livestock index, and production index."

An economic study of land utilization in Steuben County, New York, W. E. Keeper (*[New York] Cornell Sta. Bul. 674 (1937), pp. 46, figs. 12, maps 2*).—This bulletin is one of the series previously noted (E. S. R., 77, p. 870). The area and its agriculture are described. The lands in the county are classified according to the intensity of their present and probable future use, with class I about 14 percent, class II 30, class III 48, class IV 4, class V 3, and used for residential purposes 1 percent. About 80 percent of the lands in class I and about 50 percent of class II was idle or in woods and is primarily adapted to forests and recreational purposes. Classes III to V, inclusive, will probably remain permanently in agricultural use. In classes I and II, 54 and 29 percent of the houses standing from 20 to 30 yr. ago are now gone or are falling. Of the occupied farms 76 percent in class I are classed as poor, and in class II 98 percent of the occupied farms are classed as poor or fair. Over 80 percent of the farms in classes IV and V were classified as good, very good, and excellent. Labor income records for the period 1926-29 showed an average labor income of $50 for farms in classes I and II as compared with $449 in classes III to V, inclusive. Full assessed value of land and buildings ranged from $11.49 per acre in class I to $55.95 in class V. In classes III to V, inclusive, 40 percent of the occupied farms were on dirt or gravel roads and 79 percent did not have electricity available. Suggested road and electrification programs are included.

"The purchase and reforestation of land in classes I and II, insofar as people are willing to sell at reforestation prices, will benefit, directly or indirectly, nearly every citizen of the State. It will prevent people from trying to farm land much of which never should have been cleared. It will aid in the preservation of wild life and provide hunting, fishing, and recreational areas. It will help to prevent disastrous floods such as occurred in the summer of 1935 and in the spring of 1936."

An economic study of land utilization in Rensselaer County, New York, R. S. Beck (*[New York] Cornell Sta. Bul. 675 (1937), pp. 41, figs. 16, map 1*).—The analysis and discussions follow the same general lines as those in the bulletin noted above. In the classification of lands, subclasses (marked R) are made under each land class to show the lands that will probably remain in private ownership because of the demand for residential and private recreational purposes.

The percentages of the lands in the different land classes were I, 16.9, IR, 17.1; II, 0.4, IIR, 18; III, 21.5, IIIR, 17.4; IV, 1.8, IVR, 1.5; and urban, suburban, and village 5.4. By 1930, over one-fourth (97,000 acres) of the land in farms in 1910 had been abandoned. In class I, over 44 percent of the houses standing about 35 yr. ago are gone, falling, or vacant. Of the occupied farms 75 percent were classified as poor. In land classes III to IVR most of the farms were classified as good to excellent. The full value of lands and buildings ranged from $5.77 per acre in class I to $77.92 in class IVR. In classes III to IVR, inclusive, about 61 percent of the farms were on dirt or gravel roads in 1935 and 52 percent

had no electric service available. Suggested road and electrification programs are included.

A description of the agriculture and type-of-farming areas in Texas, C. A. BONNEN and B. H. THIBODEAUX (*Texas Sta. Bul. 544 (1937), pp. 91, figs. 77*).—This bulletin prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics is a revision of Bulletin 427 previously noted (E. S. R., 65, p. 678) and deals with the first phase of a study of agricultural adjustments in the State. It consists chiefly of maps with some charts and tables with brief explanatory discussions. The development of agriculture in Texas from 1836 to 1935 is described briefly. The maps show the physical, economic, and social factors that influence the agricultural production in the State, the land utilization, distribution of principal crops, different kinds of livestock, etc. The State is divided into 18 type-of-farming areas. Eleven of the areas are subdivided into 30 subareas due to differences within these areas sufficiently significant to indicate breaks in the type of farming. Each type-of-farming area is briefly described.

Statistics of Texas agriculture, L. P. GABBARD and C. A. BONNEN (*Texas Sta. Circ. 80 (1937), pp. 103, fig. 1*).—"This circular is a compilation of statistics on the agriculture of Texas as published in the various reports of the U. S. Department of Agriculture and the Census Bureau of the Department of Commerce. The data presented have been limited to established series which are published regularly and which may be kept up to date. . . .

"The data presented cover a wide range of agricultural topics. The more important ones are the following: (1) Farms and value of farm property; (2) tenure by type-of-farming areas; (3) acreage, production, yield per acre, etc., of all important crops; (4) number, value per head, etc., of each type of livestock; (5) livestock products; (6) bales of cotton ginned by counties and type-of-farming areas; (7) carlot shipments of fruits and vegetables; (8) average monthly price per unit received by producers for principal farm products; (9) cotton price quotations, spot markets, Dallas, Houston, and Galveston, and average for ten spot markets; [and] (10) farm value, gross income, and cash income from farm production. These general phases are broken down into 108 tables covering as many specific crops, livestock enterprises, agricultural commodities, etc."

Economic benefits of irrigation from the Kingsley (Keystone) Reservoir, F. MILLER and H. C. FILLEY (*Nebraska Sta. Bul. 311 (1937), pp. 57, figs. 4*).—The central Nebraska public power and irrigation project, of which the Kingsley Reservoir is a part, is described. "From this storage of some 2,000,000 acre-ft. of water, normally lost in run-off during the dormant season, 600 miles of canal will carry irrigation water to 500,000 acres in the Platte River watershed of central Nebraska. The estimated return flow, taken from the river lower in its course, will supply water to an additional 250,000 acres." In addition it is estimated that 150,000 acres can be watered from electrically driven pumps with power generated by the impounded waters.

The soils, climate, crops, present development, etc., of the area to be irrigated are described. Using past rainfall and crop records, yields of crops under irrigation in the area and in similar counties of the State, experimental data, etc., estimates are made of the probable average yields of crops under irrigation in the area to be irrigated. The effects of the development of the project on incoming and outgoing freight, population, size of farms, land use, industries, farm enterprises, etc., are discussed.

The average crop yields per acre in the area to be irrigated during the 10 yr. ended 1935 without irrigation were alfalfa 1.82 tons, barley 20.84 bu., corn 17.67 bu., oats 22.9 bu., potatoes 64.8 bu., and wheat 13 bu. Under irrigation

it is estimated that the yields should average at least as follows: Alfalfa 3 tons, barley 45 bu., corn 40 bu., oats 45 bu., potatoes 170 bu., sugar beets 10.2 tons, and wheat 20 bu. The estimated net increase in production due to irrigation in the area is 25,805 carloads annually. "Fattening livestock en route to market from the western range country should become a dominant farm enterprise." The development, it is expected, will also result in smaller farms, increased farm population, a large increase in incoming freight, cheap power, an increase in factories to process farm products grown, industrial expansion, need for additional labor, increase of urban population, etc.

The school fund mortgage loan situation in Indiana, with special reference to land use in Martin County, J. B. KOHLMEYER, J. W. VANHOY, and S. O. KESSLER (*Indiana Sta. Bul. 422 (1937), pp. 16, figs. 3*).—This study was made in cooperation with the U. S. D. A. Resettlement Administration. Primary consideration is given to the school fund mortgage situation in relation to land use in Martin County. The history and experience of every school fund loan in the county during the period 1844–1936 was studied in detail, using a questionnaire and records of the county auditor, other county officers, boards, etc. An analysis is made of the relation of school fund mortgage loans and losses to land use in one township (Brown) of the county. Among other data, tables show the average amounts of common school funds per $1,000 assessed valuation of real estate, 1935, and the percentages of increase in such funds, 1900–36, in five poor land counties and five good land counties of the State.

From 1844 to 1936 Martin County lost approximately 20 percent of the school fund mortgage money loaned. The fund is annually costing the county 6.56 percent on the outstanding principal, while if the fund was unloaned the cost would be only 5 percent. In Brown township, on an average 99.9 percent of the original principal was lost on every foreclosed loan made on lands classified as unsuited to agriculture. Since 1900, the allocation of funds has been approximately twice as great to the poorer land counties as to the better land counties. On the basis of the five poor and five good land counties selected for study, the poor land counties had relatively six times as much of the school fund mortgage monies to loan as did the good land counties. The annual school fund losses of interest and principal throughout the State are now approximately $600,000, and the actual yield is only 1.82 percent.

"In view of past and present experience in the administration and supervision of these funds, it is suggested that the present school fund laws be repealed and revised in accordance with the following features and principles: (1) Creation of a State board, authorized to employ a competent administrator, whose duties it will be to invest these funds as authorized by the law; (2) permit these funds to be invested in bonds which are direct obligations of townships, counties, or cities of the State of Indiana, or in United States Government bonds; (3) provide that the county school fund boards make no new loans; (4) provide that the counties return to the State all funds now allocated to them, preferably over a 20-yr. period with one-twentieth due each year; [and] (5) provide that future accretions to the fund be turned over to the newly established State board instead of to the county school fund."

Tax delinquency on farm real estate in Kansas, 1928 to 1933, H. HOWE (*Kansas Sta. Circ. 186 (1937), pp. 12, figs. 3*).—The data on which this report is based were gathered under the Nation-wide project financed by the Civil Works Administration and administered by the U. S. D. A. Bureau of Agricultural Economics, assisted by the State experiment stations. Tables, maps, and a chart are presented, and the ways in which delinquency arises are briefly discussed.

Total tax delinquency in 1931 was over 234 percent greater than in 1928. It decreased to approximately 231 percent in 1932. The percentage of levies for the individual years delinquent increased from 6.5 percent for 1928 to 21.73 percent for 1932. In 1928, approximately 5 million acres, nearly one-tenth of all land in farms, was delinquent, and in 1932 more than 16 million acres, nearly one-third of the farm land. During the period tax sales increased approximately 495 percent, the number of properties sold over 540 percent, and the number of acres sold over 508 percent. The percentage of properties unredeemed increased from 9.3 percent in 1928 to 65.9 percent in 1932. Private buyers constituted approximately 28.2 percent of the buyers of delinquent properties in 1928. This percentage decreased each year until it was only 7.33 percent in 1932.

Assessment of Montana farm lands, R. R. Renne and H. H. Lord (*Montana Sta. Bul. 348* (*1937*), *pp. 56, figs. 20*).—This is "a study of the inequalities resulting from present methods of assessing dry farm and range lands and some suggestions for improvement."

The basis for assessments of property prior to 1919 and under the 1919 classification law by which all property in the State was divided into 7 classes and the taxable value for the different classes was set at from 7 to 100 percent of the full and true value is described. The effects of the 1919 law, the present methods of assessment under it, and the equalization machinery are described. Studies are made of changes in assessments on lands made from 1932–36 by the county boards of equalization in 12 selected counties and by the State Board of Equalization. An analysis is made of the ratios of assessed value to sales value for over 5,200 voluntary sales of farm land in 19 selected counties covering the period 1919–35, inclusive, and the inequalities between units of different sizes from year to year and between counties are discussed. A similar analysis was also made of data gathered by a private company regarding 5,400 voluntary sales in 42 selected counties during the period 1919–30, inclusive. An analysis is also made of the inequalities in taxation indicated by ratios of assessed to productivity value among different grades of land, counties, school districts, and different sized units, and the inequalities due to different land use. In this analysis a sample area comprising approximately 1,210,000 acres in 6 counties was used. In determining the productivity values the land was divided into 4 classes of farm land on the basis of the yield of spring wheat that can normally be expected and 5 classes of grazing land based on number of acres required to graze a 1,000-lb. steer for a 10-mo. grazing season. The yields and carrying capacities of the different classes of lands were converted into acre values. The method of determining the productivity values of the different classes of land is described in detail. The valuations for the 4 classes of farm land ranged from $35 to $1.50 and for those of grazing lands from $3 to 75 ct. The effects of assessment inequalities on tax delinquency, growth of farm tenancy, and improper land use are discussed and suggestions made as to methods for improving assessments.

About two-thirds of the total revenue for the State and local governments of the State is secured from general property taxes. Farm land and buildings now comprise about one-third of the property tax base as compared with one-fifth in 1900. The average ratio of assessed to sales value in the case of the 5,200 sales in the 19 counties was 109 percent for the period studied, ranging from about 96 percent in 1919 and 1928 to 130 percent in 1932. The averages for holdings of different sales values decreased as the value increased, being 351 percent in the $0–$500 group, 99 percent in the $3,001–$5,000 group, and 62 percent in the $10,001 and over group. The averages by counties ranged from be-

tween 130 to 140 percent in Carter, Hill, and Prairie Counties to from 70 to 85 percent in Beaverhead, Lake, and Stillwater Counties. Variations from 25 to 900 percent for individual properties in the same county in the same year were not uncommon, and in some cases extreme ranges were from less than 10 percent to over 2,500 percent. There was a slight tendency to overassess farm lands without improvement as compared with similar lands with improvements, the averages for the 19 counties being 115 and 104 percent, respectively.

The ratios of assessed value to productivity value increased from 46 percent for first-grade farm land to 408 percent for fourth-grade farm land. Those for grazing land increased from 241 percent for first-grade land to 780 percent for fifth-grade land. Among the counties the ratios varied from 130 to 75 percent for the same grades of land. Variations between school districts in the same county on the same grade of land were frequently more than 20 percent. All grades of land in wheat were assessed at about $1 per acre higher than the same grades in livestock units. There was a general tendency to assess land units of less than 160 acres at a higher rate in proportion to productivity value than lands of the same grade in larger units. Small units of grazing land were assessed nearly 40 percent higher than similar grades in larger units.

To improve the assessment of farm and grazing lands it is suggested that there should be "(1) a scientific classification of all farm lands based upon their adapted use and productivity, and (2) a State agency to determine the economic value of the different classes of land and to enforce uniform compliance with established assessment standards over the entire State.

"Assessing lands according to their productivity value will result in a considerable reduction in the tax base in some areas. This will necessitate some adjustments in order to provide for the proper support of certain essential services. The following adjustments may be needed: (1) An increase in the millage levies, (2) a broadening of the tax base from which the revenue for certain services is obtained, (3) reorganization of the administrative machinery of county government to increase efficiency and lower costs, and (4) shifts or adjustments to a more extensive use of the land so that the need for certain public services will be reduced."

Farmers' mutual fire insurance in Tennessee.—II, Organization and management, C. E. Allred, T. L. Robinson, and B. H. Luebke (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 54 (1937), pp. [1]+V+48, figs. 3*).—This second part of the study previously noted (E. S. R., 78, p. 270) discusses the organization and operation of farmers' mutual fire insurance companies under chapters on organizing a farmers' mutual, successful management, special problems, example of a successful company, and some causes of failure.

Regional variation in farm price of small grains, Tennessee and United States, C. E. Allred and P. T. Sant (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 55 (1937), pp. [1]+V+32, figs. 22*).—An analysis is made of the variations in prices of wheat and oats between counties (averages 1925–35) and of barley and rye between crop reporting districts (averages 1933–36), and also of the regional differences in farm prices of the four grains within the United States and in the States of Minnesota, Montana, and Pennsylvania. The effects of freight costs, volume of production, feed production per livestock consuming unit, local demand, and other factors on regional price differences of small grains are discussed.

Economic considerations in milk-stabilization plans, J. M. Tinley (*California Sta. Mimeogr. Rpt. 62 (1937), pp. [1]+6*).—This paper presented at the Seventieth Fruit Growers and Farmers Convention held at San Jose, Calif., December 8, 1937, includes discussions of the California milk control legislation and some of the dangers of price fixing in the market milk industry.

Marketing milk [in Pennsylvania] (*Pennsylvania Sta. Bul. 352 (1937), p. 23*).—Findings by F. F. Lininger and T. K. Cowden as to the percentages of pasteurized milk in the Philadelphia and Pittsburgh milksheds and the Pennsylvania area of the New York City milkshed sold as fluid milk, and the maximum range in milk prices within a county are included.

The consumption of fluid milk in Baltimore, A. B. Hamilton, S. H DeVault, and W. H. Harper (*Maryland Sta. Spec. Bul. 4 (1937), pp. [1]+8*).—This study was made in cooperation with the Baltimore Dairy Council, and is based on 2,375 usable schedules returned from a mailing in March 1937 of 12,400 schedules to residents of different districts of the city. Tables are included showing the daily per capita consumption of milk in the north and the south areas of the city; the number of families using more and less milk than the year before; the reasons for the changes; and the number of persons by age groups, number drinking milk, and the reasons for not drinking milk. The average daily per capita consumption was 0.748 pt. An increase in the use of milk over a year before was reported by 24.4 percent of the families and a decrease by 19.5 percent. One-third of the families felt they should use more milk.

Retail marketing of apples, H. S. Gabriel (*Delaware Sta. Bul. 207 (1937), pp. 11, 12*).—Brief findings are included regarding the relative prices, spread between wholesale and retail prices, period of sale, fluctuation of retail prices, and types of stores selling apples and competing fruits, as shown in a study of statistics obtained at the warehouse of the Great Atlantic & Pacific Company in Philadelphia, Pa.

Carlot shipments of fruits and vegetables from stations in the United States for the calendar years 1934 and 1935 (*U. S. Dept. Agr., Statis. Bul. 61 (1937), pp. 141*).—This bulletin was compiled by L. Norgren and supplements Bulletin 50 previously noted (E. S. R., 75, p. 276). It is based on monthly mail reports furnished by about 8,000 local agents of transportation companies and covers 43 fresh fruits and vegetables. Tables show the total shipments by years 1926–35 by commodities, States, and months; the shipments of each commodity by State of origin and by months, 1934 and 1935; and the total shipments, 1934 and 1935, by commodities, State, county, and shipping point.

Digest of decisions of the Secretary of Agriculture under the Perishable Agricultural Commodities Act, W. L. Evans (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [3]+453*).—This is a digest of the decisions of the Secretary of Agriculture under the act approved June 10, 1930, and the amendments of April 13, 1934, and June 19, 1936, compiled from published and unpublished decisions. The substance of each ruling is stated but the facts in the case are omitted. The decisions are classified, and a key to the digest, an alphabetical index, and a publication and case index are included.

Supplement to digest of decisions of the Secretary of Agriculture under the Perishable Agricultural Commodities Act—supplementing digest issued in June 1937, W. L. Evans (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [1]+48*).—This is a supplement to the digest noted above and includes digest statements of decisions rendered from June to October 1, 1937.

Crops and Markets [October–November 1937] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), Nos. 10, pp. 205–228, fig. 1; 11, pp. 229–252, figs. 2*).—Included in the October report are seasonal reports of conditions of important crops, farm wage rates, and stocks of corn, wheat, and oats on farms; crop and livestock production reports; index numbers of prices received and paid by farmers; and market reports for cotton, dairy and poultry products, feeds, seeds, grains, and livestock and livestock products.

Included in the November report are crop and livestock production reports and market reports of the usual types; crop yield and production estimates as

of November 1 for different crops, with comparisons with 1936 and previous periods; tables showing stocks of wheat in interior mills, elevators, and warehouses, October 1; monthly indexes of prices received and paid by farmers during 1936 and 1937; average wage rates paid in different States for picking cotton by years 1926–37, inclusive; monthly hog-corn ratios by years 1927 to November 1937; etc. The cattle and lamb feeding situations and the general crop report as of November 1, 1937, are discussed. A table showing the marketing seasons for different crops, used by the Bureau of Agricultural Economics in issuing statistics, is included.

RURAL SOCIOLOGY

[Research in rural sociology] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 67, 68*).—Movements of population, including the movement of urban families and the influence of mechanization, are discussed.

[Contributions on rural sociology] (*Rural Sociol., 2 (1937), No. 2, pp. 115–122, 143–191*).—Among the contributions here presented are The Story of My Drift Into Rural Sociology, by C. J. Galpin (pp. 115–122); An Analysis of Social Processes and the Obstacles to Agricultural Progress in Mexico, by M. Gamio (pp. 143–147); Streams of Internal Migration—A Further Exploration With Swedish Data, by D. S. Thomas (pp. 148–166); An Attempt To Harmonize Discordant Theories and Contradictory Observations in the Field of Social Phenomena, by C. Gini (pp. 167–179); and The Life Cycle of Nebraska Rural Churches, by A. B. Hollingshead (pp. 180–191).

Human migration: A study of international movements, D. R. Taft (*New York: Ronald Press Co., [1936], pp. XXVI+590*).—The author treats of migration and attitudes and policies relative thereto, as the inevitable result of traditions and current influences. He conceives of maladjustments resulting from the clash of cultures as temporary and, to an extent, unavoidable costs of the culture change.

Spatial and occupational changes of particular significance to the student of population mobility, C. E. Lively (*Social Forces, 15 (1937), No. 3, pp. 351–355*).—An important characteristic of occidental societies is the large amount of mobility of the population. The author discusses three general types of movement, (1) circulation from a fixed domicile, (2) movement of domicile, and (3) transiency.

Recent changes in the farm population of the Southern States, T. L. Smith (*Social Forces, 15 (1937), No. 3, pp. 391–401*).—The author discusses changes in farm population of the 13 Southern States during the 5-yr. period 1930–35. The following are important findings:

The farm population of the Southern States increased from 15,586,149 in 1930 to 16,074,122 in 1935. The white farm population increased from 10,906,454 to 11,621,309, while the Negro farm population decreased from 4,634,652 to 4,452,815.

There was a considerable rearrangement or relocation of the farm population, a much larger percentage now living in those rural areas which lie in close proximity to cities. In the rural zone immediately adjacent to urban centers the increase of the farm population has proceeded at an amazing pace. In the counties containing cities with from 50,000 to 100,000 people the increase was also considerable—6.3 for the total population. A relocation of the population is also evidenced by the large increases which were registered in the "poor-land" areas of the South. Of the 1930 farm population only 18.3 percent resided in areas adjacent to urban centers and the poor-land areas, but these small segments accounted for more than two-thirds (66.8 percent) of

the total increase in the farm population in the 5-yr. period. Farm population decreases amounting to 2.8 percent occurred in counties representative of the better agricultural sections of the South, this figure representing a 0.1 percent gain among the white and a loss of 5.9 percent in the colored farm population.

Living conditions and population migration in four Appalachian counties, L. S. DODSON (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 3 (1937), pp. [6]+152, figs. 13*).—This report presents data on living conditions and population mobility in Avery and Haywood Counties, N. C., and Magoffin and Morgan Counties, Ky.

"The population congestion in these four Appalachian counties calls for a program that will attempt, at least, to cope with the condition and its derivative problems. The low material level of living should be raised and poor housing conditions made adequate. Educational opportunities should be more widely distributed and greater facilities for social contacts and recreation provided."

Past and future growth and structure of the Iowa population, B. D. KARPINOS (*[Ames]: Iowa State Planning Bd., 1935, pp. [8]+106, figs. 24*).—An analysis of the Iowa population.

The people of the drought States, C. TAEUBER and C. C. TAYLOR (*Works Prog. Admin. [U. S.], Div. Social Res., Res. Bul. 2, 5. ser. (1937), pp. IV+[2]+81, figs. 9*).—Today 15,000,000 people are living in the 10 Great Plains States, which 50 yr. ago included only 3,500,000 persons. Population has grown at an unprecedented rate, but despite all the moving about, the opening of new territory for agriculture, and the large rate of natural increase, there has been virtually no change in the number of people living on farms since 1910. Climate and soil imposed certain limitations upon agriculture, and the development of suitable agricultural technics was a slow and frequently a difficult process for settlers, most of whom came from more humid areas. Many who had come with high hopes of making their fortunes moved on again when these hopes proved unfounded; others remained, but their children, in turn, moved on. There is no assurance that future immigration may not occur and lead to a repetition of the errors of original settlement.

Relation of population to land utilization in Puerto Rico (*Puerto Rico Sta. Rpt. 1936, pp. 8–9, figs. 4*).—The study here reported indicated that more than 52 percent of the people of the island are employed in agriculture, and that 79 percent of all exports in 1934–35 were directly derived from agriculture. The arable land of the island decreased 22 percent in a 20-yr. period, while the birth rate has doubled and the death rate halved since 1900. This situation necessitates farming mountainsides and looking for more profitable crops to sustain the population.

Rural housing in Louisiana, E. LENOIR and T. L. SMITH (*Louisiana Sta. Bul. 290 (1937), pp. 36*).—The results of a rural housing survey, with personal visits to every rural home in six selected parishes, are reported. Ownership, age, construction, adequacy, and conveniences are among the chief phases considered.

Home ownership, over the State generally, is found to be higher on poor soil than on fertile soil. Where it is high on fertile soil it is associated with truck farming or with French culture of the population which includes a tradition of owning a little land. Plantation owners do not make extensive improvements on the houses of tenants who (1) are not supporting the additional outlay, (2) are extremely mobile and may move away within a year or two, and (3) have for generations lacked the cultural background that is necessary for taking care of a house with adequate room and modern conveniences. The standard of

living is not necessarily based entirely upon ability to pay. "Desires for higher standards of living and the ability to pay must go hand in hand." The data regarding age of the rural houses established a certain tradition of pride in ownership that can be called upon to counteract the inertia that has made rural people accept, without questioning, the inconveniences of their homes. If the ability to measure the value of expenditure by the family satisfaction derived is so directed as to improve the rural houses in Louisiana, perhaps a contribution will be made toward a higher standard of living for the farm families on whom the city and country depend.

Research memorandum on social aspects of relief policies in the depression, R. C. and M. K. White (*Social Sci. Res. Council Bul. 38 (1937), pp. XI+173*).—This is one of a series (E. S. R., 78, p. 271) of studies on the social aspects of the depression.

A sociological analysis of relief and non-relief families in a rural Connecticut town, N. L. Whetten and W. C. McKain, Jr. (*[Connecticut] Storrs Sta. Bul. 219 (1937), pp. 79, figs. 9*).—This study is based upon a complete enumeration of the entire rural town of Montville, situated between the cities of Norwich and New London and containing a population of about 4,000. This sample represents southeastern Connecticut, an area characterized by part-time farming and decentralized industries in which the relief rate was high.

Montville shows a higher rate of relief than the State of Connecticut as a whole. During the 5-yr. period 1930–34 more than one-third of all the families in the township had been on the relief rolls at one time or other. A differential rate of relief was revealed, the highest among unskilled workers and the lowest among business and professional people. Foreign-born were over-represented on the rolls.

Relief families averaged larger than nonrelief. The heads of relief families had received an average of 6 yr. of schooling compared with 7.7 yr. for the nonrelief. More than one out of eight homes contained less than one room per person.

Research and subsistence homesteads, L. A. Salter, Jr. (*Rural Sociol., 2 (1937), No. 2, pp. 206–210*).—"If social research is to be useful in the making of decisions on policies of social programs, (1) it must be organized for this purpose and not restricted solely to providing information to assist the administration of predetermined policies, (2) it will call for the concentration and combination of research forces, and (3) if comprehensive studies are not possible, material on similar problems must be organized on comparable bases and the experience of the various researchers must be combined in forming policy judgments."

The farm family and its community problems, D. E. Lindstrom (*Rural Sociol., 2 (1937), No. 2, pp. 210–214*).—The first concern of the county agent and home demonstration agent is to assist farm families toward greater security. They must also give increasing attention to the matter of a more abundant life on the farm. They are confronted with the task of developing community leaders and community organization. "Good farming enhances family life, and a sound agriculture in turn depends upon an enhanced family life on the farm. Community organizations must redirect their efforts therefore to the end that farm family life may be improved, if agriculture is to progress."

Neighborhood buying units, R. Russell (*Rural Sociol., 2 (1937), No. 2, pp. 214, 215*).—"The Washington Consumers' Club is an unincorporated purchasing association that has been in operation about 2½ yr. It serves the District of Columbia and its environs in Maryland and Virginia, providing groceries, fuel, and other consumers' goods for its members."

Government in rural America, L. W. LANCASTER (*New York: D. Van Nostrand Co., 1937, pp. XI+416*).—The government and administration of the rural county, township, and school district in the United States are described.

Trends in the fertility of married women of different social groups in certain rural areas of North Carolina, C. H. HAMILTON and M. YORK (*Rural Sociol., 2 (1937), No. 2, pp. 192–203, figs. 5*).—The data on which this paper is based were taken from a study of 1,703 families located in the open-country areas of five North Carolina counties. From 300 to 500 households were surveyed in each area, about one-half being in the Piedmont and the other half in the Coastal Plain areas. The adjusted fertility rate in the five rural areas studied dropped approximately 30 percent between 1915 and 1934.

Although fertility rates of Negro women have been consistently higher than those of white women, the differences have not been so great in recent years. The fertility rate of Negro women showed little tendency to decline before 1925, whereas that of white women began dropping rapidly about 1921. A study of the general trend of the fertility rates reveals no significant difference between relief and nonrelief women. The fertility of wives of farm owners is on the average significantly lower than that of wives of tenants, sharecroppers, and farm laborers. Many families, particularly of the lower economic strata, are unnecessarily large, while some of the well-to-do groups rear too few children.

Youth, a world problem: A study in world perspective of youth conditions, movements, and programs, W. T. WINSLOW (*Washington: Natl. Youth Admin., 1937, pp. XV+138*).—This is a summary of the situation of the youth in 58 countries. A foreword by A. Williams is included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[Investigations in rural education by the Pennsylvania Station, 1936–37] (*Pennsylvania Sta. Bul. 352 (1937), p. 53*).—Brief findings by W. F. Hall, W. A. Broyles, H. S. Brunner, and C. S. Anderson as to the average tenure of teachers of agriculture in public schools and the correlation between "final placing scores" and "total scores" in the 1936 State judging contests are included.

The response of government to agriculture, A. P. CHEW (*U. S. Dept. Agr., 1937, pp. [3]+108*).—This is "an account of the origin and development of the United States Department of Agriculture on the occasion of its 75th anniversary [E. S. R., 78, pp. 1, 145]." The subject is dealt with under the following headings: Seventy-five years of growth and adaptation, beginnings of Federal agricultural work, establishment of the Department, plant exploration and adaptation, breeding better plants and animals, battles against livestock diseases, chemistry—a basic agricultural science, the insect peril, growth of forest care, dependence on State cooperation, guarding the food and drug supply, the weather services, economic information, marketing—a Federal problem, continuity of the national agricultural policy, toward higher standards of living, conserving soil and water, the man and the land, the central paradox, and the final aim. An agricultural chronology showing important national legislation affecting agriculture and the Department from 1776 to 1936 is also included.

Washington, Jefferson, Lincoln, and agriculture (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. VI+102, figs. 4*).—This is a collection of observations on agriculture by Washington, Jefferson, and Lincoln. The selections here included "present the views of these leaders on the place of agriculture in the life of the Nation, their farming experiences, and the contemporaneous agricultural conditions." An introductory note by E. E. Edwards, who is responsible for the selections, is included.

FOODS—HUMAN NUTRITION

The forty-first report on food products and the twenty-ninth report on drug products, 1936, E. M. Bailey (*Connecticut [New Haven] Sta. Bul. 401 (1937), pp. 857–882*).—Of particular interest in this annual report of routine analyses of foods and drugs (E. S. R., 76, p. 272) are vitamin C assays for a number of orange beverages, with estimated content of orange juice, and for several commercial brands of tomato juice.

The alleged decalcifying effect of cereals, F. C. Bing et al. (*Jour. Amer. Med. Assoc., 109 (1937), No. 1, pp. 30, 31*).—In this report, presented by the Council on Foods of the American Medical Association, as to the anticalcifying effect supposed by some investigators to be a property of cereals, the literature dealing with the evidence of the existence of a toxamine and the more recent studies on the processes that take place in experimental rickets and in particular the effect of the cereal component of the rickets-producing diet are reviewed. The experimental results obtained are explained on the basis of the calcium : phosphorus ratio in the diet, with consideration given to the availability of the phosphorus of the cereal component.

It is concluded that there is no definite evidence for the existence of a decalcifying factor in cereals and, therefore, no necessity to irradiate cereals or to add vitamin D substances to cereal products intended for general human consumption in order to counteract the harmful effects of a hypothetical toxamine.

The nutritive value of papaya, C. D. Miller and R. C. Robbins (*Biochem. Jour., 31 (1937), No. 1, pp. 1–11, figs. 3*).—This complete report of the study referred to previously (E. S. R., 76, p. 877) contains data on the mineral, vitamin, and acid-base values of papaya. The organic nutrients, calcium, phosphorus, iron, chlorine, moisture, and acid-base balance were determined by modifications of the methods of the A. O. A. C., 1930. For the vitamin A experiments, 0.1 and 0.2 g of papaya were given three times weekly and 4 units of carotene (1931 international standard) were given twice weekly to groups of rats maintained on a diet consisting of 18 percent extracted casein, 10 dried yeast, 4 salt mixture, 1 sodium chloride, 57 cornstarch, and 10 percent Crisco and sufficient viosterol to supply 1 part per 40,000 of diet. For the vitamin B_1 tests, the rats received the basal diet recommended by Sherman supplemented by 6 g of papaya daily. The Bourquin and Sherman method (E. S. R., 66, p. 410) was followed for the vitamin B_2 (G) tests, with an alcoholic extract of rice bran substituted for the whole wheat extract and supplemented by 2 and 3 g of papaya daily. The vitamin C tests were made on guinea pigs receiving the Sherman scorbutic diet supplemented by fresh alfalfa, together with 2 and 3 g of papaya daily until the latter was eaten readily. The Höjer method (E. S. R., 57, p. 295) of histological examination of the incisor teeth was employed.

Chemical tests to determine the ascorbic acid content were made by titration with 2,6-dichlorophenolindophenol, as described by Bessey and King (E. S. R., 71, p. 137), with slight modification, and the iodine method used by Lorenz. The ascorbic acid was extracted from the fruit by 8 percent hot acetic acid solution in redistilled water. A number of tests were made to determine the value of treatment with various reagents to remove interfering substances and to have all the ascorbic acid in the reduced form, and since the best results were obtained by bubbling hydrogen sulfide into the extract of papaya in acetic acid and removing it by washing carbon dioxide through the solution, this procedure was followed. The variations in ascorbic acid content were determined during the ripening process.

Triplicate determinations on a composite sample of three ripe papayas gave a composition expressed as percentage of the fresh edible fruit as 0.13 percent acid,

85.6 water, 0.5 protein, 0.3 ether extract, 0.8 crude fiber, 12.3 carbohydrate, 0.51 ash, 0.019 calcium, 0.013 phosphorus, 0.00025 iron, and 0.132 percent chloride. Tests made on eight samples grown at different elevations and at varying distances from the sea showed variations of from 84 to 91.3 percent in the moisture content, from 0.33 to 0.7 in total ash, from 0.01 to 0.026 in the calcium, and from 0.061 to 0.244 percent in the chloride content. The average papaya is estimated to contain 2,500 international units of vitamin A, 8 of vitamin B_1, 70 mg of ascorbic acid, and 33 Bourquin-Sherman units of vitamin B_2 per gram of edible material.

The vitamin C content increased during the ripening process from 0.265 to 0.618 mg per gram of fresh fruit, as determined by the dye titration method. Except in one case, the results obtained by the iodine method were higher than those by the dye method, with a greater difference resulting after the hydrogen sulfide treatment. The dye method was accepted as being more accurate.

The effect of winter storage on the palatability and vitamin content of potatoes grown in Montana, H. L. Mayfield, J. E. Richardson, R. J. Davis, and E. J. Andes (*Montana Sta. Bul. 346 (1937), pp. 23*).—Two outstanding varieties of potatoes raised in Montana, the Netted Gem and the Bliss Triumph, were stored during the winter in two types of storage cellars—the potato storage house maintained by the horticultural department of the station and a vegetable room in a private home. In the first, temperature (ranging from 37° to 46° F.), humidity, light, and ventilation were kept under control, while in the second ventilation and light were supplied by a north basement window and the temperature (ranging from 55° to 60°) was not under control. The first type of storage was designated as cool and damp and the second warm and dry.

After storage for 6 mo. in the cool damp cellar the Netted Gem potatoes developed a greenish-yellow color and acrid flavor and were less palatable than the same variety stored in the warm dry cellar, while the Bliss Triumph showed only an occasional change in color and were somewhat more desirable than those of the same variety stored in the warm dry cellar. The color which developed in the Netted Gem variety was not associated with a higher percentage of solanine, for the potatoes which remained white contained as much solanine as those which turned yellow. In both varieties there was in increase in solanine during storage in either cellar.

Biological tests for vitamin B_1 and biological and chemical tests for vitamin C gave somewhat confusing values for the two varieties stored in the two ways and tested raw and cooked. In the fall about 1.3 g of either raw or cooked potatoes of the Netted Gem variety furnished 1 Sherman unit of vitamin B_1. After storage in the cool damp cellar there appeared to be no loss in the raw potatoes but a loss of about 19 percent in the cooked.

Both animal and chemical tests for vitamin C in the fall indicated that the raw Netted Gem variety contained about 6.3 Sherman units per ounce. After 6 months' storage in the cool damp cellar no loss was apparent in the raw potatoes tested biologically but a one-third loss in those tested chemically. Cooked potatoes showed a loss of about 45 percent when tested both biologically and chemically. Storage for the same length of time in the warm dry cellar caused practically no loss in vitamin C as determined either raw or after cooking and by both animal and chemical tests. The Bliss Triumph variety gave the same values for C when tested in the fall, but after 6 months' storage in the cool damp cellar biological tests showed a loss of from one-third to one-half in the raw potatoes and somewhat more than one-half in the cooked. Chemical tests indicated a somewhat smaller loss. Corresponding storage in a warm dry cellar caused about a one-fifth loss in the raw potato according to

animal and chemical tests. The cooked potatoes showed still further loss as determined biologically but no loss as determined chemically.

Previously reported tests by Richardson et al. (E. S. R., 78, p. 428) were repeated in the spring after storage in the cool damp cellar and showed that servings of cooked potato in the spring contained in general about two-thirds as much vitamin C as in the fall.

The effect of home preservation on the quality and vitamin content of Golden Bantam sweet corn, J. E. RICHARDSON, H. L. MAYFIELD, and R. J. DAVIS (*Montana Sta. Bul. 347 (1937), pp. 23, figs. 2*).—The sweet corn selected for this study was of the Golden Bantam variety grown on irrigated land in the eastern portion of the Gallatin Valley at an altitude of 4,800 ft. above sea level and harvested about 20 days after silking.

Four general methods of preservation were used—canning, drying, salting, and fermenting. For the canning, the corn was cut from the cob, cream style, and processed in pint jars in a steam pressure cooker according to the recommendations in Farmers' Bulletin 1471 (E. S. R., 55, p. 189), with the pressure adjusted to high altitude. Processing periods of 70, 75, and 80 min. at 250° F. and 90 min. at 240° were followed. For purposes of comparison of spoilage, samples were also canned by methods no longer recommended for nonacid vegetables, including water bath, steamer, and oven processing. The dried corn was prepared by precooking husked ears in boiling water for from 8 to 10 min., cooling, cutting the corn from the cob, and drying in thin layers on pans in ventilated ovens at from 100° to 150°. The salted corn was precooked as for drying and the cut corn packed in stone jars in alternate layers with dry salt in the ratio of 1 part of salt to 4 or 7 of corn and kept in the jar under a weighted cover for 2 or 3 weeks. The fermented corn was prepared by placing the raw corn cut from the cob in a stone jar, covering with a weak vinegar and salt brine, and allowing it to stand covered in a warm place for about 2 weeks to complete the lactic acid fermentation.

No spoilage occurred in the corn canned in the pressure cooker but there was a high percentage of spoilage with the other methods even when the processing periods were extended over 5 or 6 hr. Processing for 75 min. at 250° is recommended. With dried corn the greatest tendency to spoilage was during the drying process. Rapid drying is necessary to prevent souring and careful temperature control to prevent caramelization. A tendency to mold in the salted and fermented corn was reduced by transferring the material as soon as possible from the stone jars to smaller glass jars and sealing.

The relative desirability of the corn preserved in the various ways was determined by using the material for the preparation of several corn dishes, recipes for which are included. When judged for flavor, texture, color, and general desirability, the salted corn ranked first, followed by the canned corn, and then the dried corn. The fermented corn was considered the least desirable. Vitamin tests of the cooked corn gave the following general results:

"The vitamin A content of corn preserved by drying or salting and cooked is the same as that of raw frozen corn. The vitamin A activity of cooked fermented corn seems to be almost twice and of canned corn less than one-half that of raw corn. Dried or salted corn (cooked) and canned corn contain about one-fourth as much vitamin B_1 as raw frozen corn. When corn is fermented in brine, there is a still greater loss of vitamin B_1. Dried, salted, fermented, and canned corn, when cooked, are fair sources of vitamin C according to chemical determinations. From the limited animal tests, canned corn appears to be a rather poor source of vitamin C."

Food requirements and food intakes, R. A. McCANCE and E. M. WIDDOWSON (*Brit. Med. Jour., No. 3997 (1937), pp. 311, 312*).—Some of the assumptions and

deductions commonly made in the study of human food requirements and intakes are discussed. The authors recommend the substitution of the term "minimum requirement" for the unqualified term "requirement." The minimum requirement for children is defined as "the least amount of any dietary constituent which will support an optimal rate of storage in the growing body." For the adult it represents "the least amount of any dietary constituent necessary to maintain a perfectly healthy individual in equilibrium for a given (usually a short) period of time." It is noted that the "optimum requirement" is of far greater practical importance than the minimum requirement but is very difficult to evaluate. The shortcomings of the "family" method of determining the food intake are prescribed. In a comparison of the family with the "individual" method of study, it is shown that any results obtained by the former technic can be obtained by the latter with greater accuracy and without having to make any assumptions. "The individual method of study is not difficult, and we would urge those desirous of making nutritional investigations to give it a trial rather than to follow slavishly a method the results of which are so very difficult to interpret."

A respiration chamber for use with human subjects, L. H. Newburgh, M. W. Johnston, F. H. Wiley, J. M. Sheldon, and W. A. Murrill (*Jour. Nutr., 13 (1937), No. 2, pp. 193–201, figs. 3*).—The authors describe, with diagrams, a modification of the Benedict respiration chamber for large animals for use with human subjects.

Further experiences with the measurement of heat production from insensible loss of weight, L. H. Newburgh, M. W. Johnston, F. H. Lashmet, and J. M. Sheldon (*Jour. Nutr., 13 (1937), No. 2, pp. 203–221*).—Observations were made on 2 diabetic and 18 normal young adults, using the chamber referred to in the paper noted above. The calculation of heat production from the insensible loss of weight, the dietary intake of carbohydrate, and the urinary nitrogen yielded values differing less than 5 percent from those obtained by indirect calorimetry. It is recommended that the mean of several 24-hr. periods be used when heat production is calculated from insensible loss of weight.

The investigation of intermediary metabolism with the aid of heavy hydrogen, R. Schoenheimer (*Bul. N. Y. Acad. Med., 2. ser., 13 (1937), No. 5, pp. 272–295, figs. 5*).—This 1937 Harvey lecture is based upon the extensive series of investigations of the author and D. Rittenberg noted previously (E. S. R., 78, p. 275).

Some quantitative studies on refection in the rat, E. Kelly and H. T. Parsons (*Jour. Nutr., 13 (1937), No. 5, pp. 453–468, figs. 2*).—In this contribution from the Wisconsin Experiment Station the authors describe a series of tests in which rats maintained on a ration containing 50 parts of raw potato starch exhibited phenomena with the characteristics of the refection observed by Fridericia and others (E. S. R., 58, p. 792). The use of purified rations containing raw potato starch as the only possible source of the vitamin B complex did not produce this condition. In a group of 40 rats maintained on the basal diet in which the potato starch had been barely gelatinized by moist heat but with no detectable destruction of the vitamin B_1 15 developed manifestations of a nutritional disorder closely resembling those attributed to vitamin B_4 deficiency. The injection of a vitamin B_1 concentrate resulted in a swift and complete recovery, but the feeding of a vitamin B_4 preparation did not cure the condition.

Paired feeding experiments were made on groups of rats maintained on equalized intakes of rations containing either high or low fat and raw or gelatinized potato, corn, or rice starch. The vitamin B content of the feces and of the body organs was determined by feeding tests on other groups of

rats. The rats receiving the raw potato starch eliminated about 3 times as much total vitamin B in the feces as did those receiving the gelatinized potato starch. No difference in the vitamin B elimination was noted between raw and gelatinized corn and rice starches. The nonextractable fat of the starch did not appear to be a significant factor in the phenomena of refection.

The effect of ingesting dry wines with meals on urine composition and plasma CO_2 combining capacity of the blood, E. M. Mrak and J. H. Fessler (*Wines and Vines, 18 (1937), No. 6, pp. 8, 9, 22*).—Four healthy young men were placed upon an approximately neutral diet for 6 days and were then given 12 oz. of sauterne-type wine each day for 4 days, followed by 12 oz. daily of a claret-type wine for 5 days. Daily urine samples were analyzed for total titratable acidity, organic acids, ammonia nitrogen, and pH value. The alkaline reserve of the blood was determined three times during the control, white wine, and red wine periods. It is concluded that the addition of the two types of wine had no significant effect on the composition of the urine or on the plasma carbon dioxide combining power of the blood.

The effect of ingesting dry wines with meals on urine composition and plasma CO_2 combining capacity of the blood [trans. title], J. H. Fessler, E. M. Mrak, W. V. Cruess, and J. J. Hayes (*Ztschr. Untersuch. Lebensmtl., 72 (1936), No. 5–6, pp. 461–463*).—Essentially noted above.

Retention and utilization of orally administered iron, W. M. Fowler and A. P. Barer (*Arch. Int. Med., 59 (1937), No. 4, pp. 561–571*).—The subjects were 10 patients with a microcytic hypochromic type of anemia. Observations were made during 6-day balance periods preceded by a 3-day adjustment period. Three standard diets were fed alternately during the periods and contained 1 g of protein per kilogram of body weight, supplied about 150 percent of the basal caloric requirement and from 9 to 12 mg of iron, and had an acid-base ratio of approximately 1 : 2.3. Daily supplements of iron and ammonium citrate supplying 500 mg of metallic iron were administered. The iron content of the diets was computed from food tables and of the iron supplements and excreted iron by analysis, using the method of Reis and Chakmakjian (E. S. R., 67, p. 105). Nitrogen and phosphorus determinations were made. The hemoglobin content was determined by the Newcomer method and the hematocrit value by the Van Allen method daily or on alternate days, together with erythrocyte, leucocyte, and reticulocyte counts. Differential leucocyte counts were made during each balance period.

Following oral administration of the iron supplements, the percentage of iron retained by the body varied from 14 to 71.3 percent and averaged 32.6 percent. In all cases the anemia responded well to the administration of iron and ammonium citrates, with an increase in hemoglobin concentration and a normal reticulocyte response. The percentage of administered iron used in the formation of hemoglobin was calculated to be from 1.2 to 3.42 percent and averaged 1.96 percent, suggesting that a large part of the iron retained within the body is deposited in some form other than hemoglobin in the blood. No correlation was found between the original hemoglobin level and the amount of iron retained or the percentage utilized. The average daily nitrogen balance of +0.18 g increased with the administration of iron to +1.32 g, and the phosphorus balance increased from +0.07 to +0.19 g per day. The total leucocyte and differential counts showed no significant changes during iron therapy.

Retention and utilization of small amounts of orally administered iron, W. M. Fowler, A. P. Barer, and G. F. Spielhagen (*Arch. Int. Med., 59 (1937), No. 6, pp. 1024–1028*).—In continuation of the above study, the authors conducted further balance studies on six patients with hypochromic anemia to determine

the amount of iron retained when daily doses varying from 170 to 250 mg of metallic iron in the form of iron and ammonium citrates were administered orally. The percentage of the administered iron retained by the body varied from 10.3 to 45.1 percent and averaged 26.6 percent. In all cases the administration by mouth of iron and ammonium citrates in doses of 1 and 1.5 g daily resulted in the replenishment of the depleted stores of iron and produced a fairly rapid increase in the hemoglobin content. It was calculated that from 7.5 to 12.4 percent of the administered iron was used in the formation of hemoglobin, which is considerably higher than the amounts utilized by the patients in the previous study, who were given larger doses of iron. Of the iron which was retained by the body, approximately 30 percent was used in the formation of hemoglobin, while the remaining 70 percent was presumably stored in the spleen, liver, and other parts of the reticulo-endothelial system.

Absorption of iron compounds from the upper part of the small intestine, J. Groen and F. H. L. Taylor (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 694, 695*).—Observations are reported on a study of the absorption of ferrous, ferric, and complex iron compounds from a 50-cm isolated segment of the small intestine of a fasting subject. The iron salt was dissolved in 100 cc of distilled water and introduced into the gut in such amounts that from 80 to 100 mg of iron were present. After 30 min. the solution was aspirated, and washings were made of the intestine and stomach for 30 min. The intestinal contents and washings were analyzed for total iron. By this method from 20 to 35 percent of the iron administered in the form of ferric salts was recovered as compared with from 60 to 76 percent from the ferrous salts and 100 percent from ferric ammonium citrate.

In a second series of tests following the same technic but extending the washing period from 30 min. to 3½ hr. and analyzing each washing separately for iron, it was found that the intestine slowly yielded up additional amounts of iron until at the end of 3½ hr. 100 percent of all forms of iron had been recovered. "It appeared that the highly ionizable iron salts entered into combination or were absorbed by the mucus, while ferric ammonium citrate possessing little 'astringent' properties was not."

Iron retention in infancy, G. Stearns and D. Stinger (*Jour. Nutr., 13 (1937), No. 2, pp. 127–141, figs. 4*).—The retention of iron by 14 infants of from 7 to 54 weeks of age was studied throughout 107 3-day balance periods. Except for 1 infant which was given human milk, the diet consisted of evaporated cow's milk acidified with citric acid and containing a cod-liver oil concentrate and 6 percent dextrin-maltose mixture supplemented by 2 oz. daily of orange juice. Egg yolk, spinach, iron-rich cereal, and an iron salt were given to increase the iron intake, and the effect upon the iron retention was observed. The influence of potassium, calcium, and phosphorus intake levels upon the retention of iron was also studied.

The infant given human milk was never in negative balance, although the iron retention was very small. An average loss of 0.05 mg of iron daily is reported for the 13 infants receiving cow's milk feeding alone, and the retention was not improved by the addition of egg yolk or spinach in the amounts fed. A definite increase in retention resulted from the feeding of the special cereal or of ferric ammonium citrate. No consistent relationship was observed between the retention of iron and the intake of potassium, calcium, or phosphorus. Whether the source of iron was iron-rich cereal, egg, or a ferric salt, "it appears that an intake of approximately 0.5 mg per kilogram body weight is necessary to insure a retention of iron, and an intake of 1 to 1.5 mg per kilogram permits ample retention."

The conservation of blood iron during the period of physiological hemoglobin destruction in early infancy, G. STEARNS and J. B. MCKINLEY (*Jour. Nutr., 13 (1937), No. 2, pp. 143–156, fig. 1*).—In continuation of the study noted above, determinations of blood iron were carried out at short intervals, and iron excretion was observed for several periods of varying length each during the first 2 mo. of life. Hemoglobin determinations were made by the Newcomer method, and the hemoglobin iron content was calculated by using 3.35 mg as the amount of iron per gram of hemoglobin. The results were compared with the values found by chemical determination of the blood iron. Iron determinations were also made on feces samples and on the constituents of the diet.

The average hemoglobin concentration decreased from 17.2 g per 100 cc at from 10 to 14 days of age to 15.6 g at from 2 to 3 weeks and to 10.5 g during the seventh and eighth weeks of life. Until the fourteenth day of life the determined blood iron was greater than the calculated hemoglobin iron, the minimum values being 58.4 and 57.6 mg per 100 cc, respectively. After this period the calculated hemoglobin iron was consistently greater than the determined iron. The minimal hemoglobin iron value of 32.8 mg per 100 cc was reached about 2 weeks after the low hemoglobin level, and during the latter part of the study the values approached 35 mg of iron per 100 cc of blood. The minimal value for blood iron was reached between 4 and 6 weeks of age, and in all cases the iron losses continued for some time afterwards. The average daily loss was 1.25 mg of iron, and throughout the study the amount of iron excreted was always greater than the intake. "It is concluded that a dietary source of iron is desirable well before 6 mo. of age."

The iron metabolism of normal young women during consecutive menstrual cycles, R. M. LEVERTON and L. J. ROBERTS (*Jour. Nutr., 13 (1937), No. 1, pp. 65–95, figs. 3*).—In this continuous balance experiment total iron exchanges of four normal young women receiving an adequate diet containing from 10 to 13 mg of iron were determined during consecutive menstrual cycles over a period of from 3 to 5 mo. The study was divided into consecutive 5-day periods, with a single foundation dietary used for each subject during each period. Food, feces, urine, and menses flow samples were analyzed for total iron. The results of the daily hemoglobin and red blood cell determinations have been noted (E. S. R., 76, p. 131).

The average daily iron intakes were 13.61, 11.87, 10.03, and 11.71 mg, respectively, with corresponding balances between food and excreta of +0.72, +1.48, +0.71, and −0.2 mg. A negative iron balance never occurred when the daily iron intake from the food was 0.225 mg or more per kilogram of body weight. No relationship could be demonstrated between the time of iron storage and its loss during the menstrual period. The menstrual losses were relatively constant for each subject and averaged 14.26, 22.84, 11.13, and 13.8 mg of iron, respectively. After the menstrual losses had been subtracted from the balance between the iron intake and excretion for each cycle, the subjects were in iron equilibrium or slight positive balance in 9 of the 16 menstrual cycles.

From the data obtained on the four subjects, the dietary iron standard for a normal 56-kg woman has been calculated to be approximately 17 mg per day. "The results of this study, together with the fact that the average dietary seldom contains even 15 mg of iron, indicate that the low hemoglobin values which are accepted as normal for women because of the drain due to menstruation may be a direct reflection of the use of diets habitually low in iron rather than due to the small periodic loss in the menses."

The physiology of zinc in the nutrition of the rat, E. Hove, C. A. Elvehjem, and E. B. Hart (*Amer. Jour. Physiol., 119 (1937), No. 4, pp. 768–775, figs. 2*).—This paper is one of a series previously noted in progress at the Wisconsin Experiment Station (E. S. R., 77, p. 562). The authors studied the relationship of zinc to carbohydrate and protein metabolism in zinc-deficient rats and the effect of the administration of whole pituitary and pituitary growth hormone on zinc-low rats, following the method of preparing the animals and using the same rations as described previously. Urinary and blood sugar, nitrogen, liver glycogen, serum protein, and glucose tolerance were determined. The zinc-low rats showed a distinct irregularity in the glucose tolerance curve which is attributed to a delay in the absorption rate in the intestine. In the zinc-deficient rats a distinct increase in the time required to reach the maximum blood nonprotein nitrogen level after alanine feeding was noted. The total urinary nitrogen was about the same per gram of food eaten for both groups, while the urinary creatinine was decreased by 20 percent in the zinc-deficient rats. The results suggest that zinc-deficient rats have a lower rate of endogenous metabolism. A marked growth stimulation and an increase in efficiency of converting food to body weight was noted in the zinc-deficient rats in which whole pituitary transplants had been made. A less pronounced response was given by the injection of pituitary growth hormone. "It is postulated that zinc is involved in the production or utilization of some hormone of the pituitary which controls the motility and tonus of the intestinal tract."

[**Vitamin studies of the Pennsylvania Station**], R. A. Dutcher, N. B. Guerrant, and F. S. Tabor (*Pennsylvania Sta. Bul. 352 (1937), pp. 20, 21, 22*).—Progress reports are given on studies dealing with the vitamin A content of cream cheese, the relative flavine content of white and yellow corn, and the effect of carotene intake on the vitamin D requirement of rats.

A comparison of heated casein with extracted casein in the basal diet for the determination of vitamin A, E. N. Todhunter (*Jour. Nutr., 13 (1937), No. 5, pp. 469–476*).—In this contribution from the Washington Experiment Station the author reports a series of comparative tests made on three groups of carefully matched vitamin A-depleted rats maintained on diets in which the casein had been heat-treated or alcohol-extracted.

The results show that both methods of preparing the casein for use in vitamin A-free basal diets may be followed. No marked difference was observed in the growth responses, time for depletion, or survival period of the animals on the two diets with and without added vitamin A supplement.

Vitamins in human nutrition.—Vitamin B_1, and the "brown versus white bread" problem, I, II (*Biochem. Jour., 31 (1937), No. 5, pp. 799–811, figs. 8; 812–816, figs. 3*).—This paper is presented in two parts.

In the first part, by L. J. Harris, comparisons are made of the vitamin B_1 content of "whole meal," "germ," "bran," and white breads, using the bradycardia method of Birch and Harris (E. S. R., 73, p. 567), which was found to be the only satisfactory technic for use in assaying foods of a highly starchy nature and containing only traces of vitamin B_1. White bread from a retailer was found to contain 0.15 international unit of vitamin B_1 per gram, two samples of proprietary germ bread 0.8 and 0.9, respectively, and proprietary whole meal bread 0.75 international unit per gram. Of breads baked in the experimental laboratory, white bread contained 0.12 international unit, two samples of "with germ" 0.8 and 0.9, respectively, whole meal 0.9, two samples of "without germ" 0.8 and 0.65, respectively, and bran bread 0.5 international unit of vitamin B_1 per gram. The proprietary germ bread prepared from a mixture of 3 parts white flour and 1 part treated germ was only slightly

superior to the ordinary whole meal bread, although it contained from 7 to 8 times as much vitamin B_1 as did the white breads tested. Also, the ordinary brown breads, which are described as without germ or bran breads, were not very inferior to either the whole meal or the germ bread samples.

In the second part, by P. C. Leong and L. J. Harris, the flours and their separate constituents were compared and the following values are reported: Two specimens of white flour 0.2 and 0.3 international unit, respectively; proprietary "germ flour" purchased from the retailer 1.2 and from the manufacturer 1.3; whole meal flour and a germ flour prepared from a mixture of 3 parts white flour and 1 part raw germ 1.5; two specimens of commercial wheat germ 6 and 6.6, respectively; two pharmaceutical proprietary preparations 8.4 and 9.6, respectively; middlings 4.5; and bran 3.6 international units of vitamin B_1 per gram. As noted in the first paper, the germ flour from which the germ bread is prepared was only slightly superior to the whole meal flour used in the preparation of ordinary whole meal bread.

On the claim for a new essential dietary factor in mammalian liver, N. Halliday and H. M. Evans (*Jour. Nutr., 14 (1937), No. 1, pp. 45–54, figs. 2*).—In continuation of a previous study (E. S. R., 78, p. 284) the authors investigated the extent of the influence of the dietary essential described by Elvehjem, Koehn, Jr., and Oleson (E. S. R., 78, p. 285) in tests for vitamin B_6. The diets previously described were used, and the same experimental procedure was followed. Groups of rats receiving diet 787–B were given supplements of air-dried fresh hog liver, the alcohol-ether precipitate, the adsorbate alone or in combination, without added flavine. Another group was fed diet 793 supplemented by vitamin B, flavine, and the precipitate fraction. Another group receiving diet 793 with vitamin B and flavine added was given as supplement the filtrate (filtrate W), which remained after adsorption in the preparation of the flavine concentrate from the liver, and after the development of mild dermatitis the precipitate fraction was administered. The curative property of the precipitate was also studied in rats with severe dermatitis which had survived the tests for various materials as a source of vitamin B_6.

The results show that all rats receiving the liver precipitate were completely protected from dermatitis, and when the precipitate was supplemented with flavine or the adsorbate and filtrate portions normal growth resulted. While the animals on the higher levels were protected, those receiving 0.25 g or less of dried liver developed dermatitis. The rats receiving the filtrate factor in addition to vitamin B and flavine developed mild dermatitis and showed little growth. The addition of the precipitate in an amount equivalent to 1 g of fresh liver resulted in rapid healing and a return to normal growth. The precipitate also gave satisfactory results as a curative agent in four out of seven rats with severe dermatitis. The three remaining animals were too ill to respond and died within a few days after the precipitate was given.

The authors conclude that vitamin B_6 is carried down in the alcohol-ether precipitate and that the flavine fraction passes into the supernatant liquid and remains after adsorption. The results do not confirm the conclusion of Elvehjem and his coworkers that a new dietary factor from liver is necessary in addition to the vitamins B_1, B_3, B_4, B_6, and flavine for the growth of rats.

The findings are discussed by C. A. Elvehjem in an addendum.

The identity of flavin with the cataract-preventive factor, P. L. Day, W. J. Darby, and W. C. Langston (*Jour. Nutr., 13 (1937), No. 4, pp. 389–399, figs. 3*).—In continuation of previous studies (E. S. R., 77, p. 428) and following the same procedure, the authors report a series of experiments made on groups of rats in which the vitamin B-deficient diet was supplemented with 30, 60, and

90 μg of pure lactoflavine, and the cataract-preventive action was studied. Weekly ophthalmoscopic examinations were made, together with examination of the eye with a flash lamp in a dark room after the pupil had been dilated with 0.5 percent atropine sulfate solution. To differentiate the cataract-preventive and the rat dermatitis-preventive factors, groups of rats were fed diet 625 without the rice polish and supplemented with (1) 60 μg of crystalline vitamin B, (2) rice polish extract, (3) 30 μg of lactoflavine and 60 μg of crystalline vitamin B, and (4) 30 μg of lactoflavine and rice polish extract.

The results show that test diet 625 is adequate for growth up to 10 g weekly when supplemented with pure lactoflavine, thus indicating that the rice polish extract in the diet contains considerable amounts of all the B vitamins required for growth in the rat except flavine. Since a large percentage of the rats receiving the flavine-deficient diet developed cataract and the condition was prevented by the addition of pure flavine, it is concluded that flavine is a specific cataract-preventive factor for the rat. The characteristic inflammation and edema of the extremities known as "rat pellagra," "florid dermatitis," or "rat acrodynia" developed in the animals receiving the vitamin B-deficient diet supplemented with crystalline vitamin B. Flavine supplement failed to prevent this syndrome. "Thus flavine deficiency, evidenced by alopecia and cataract, can be clearly distinguished from this other symptom-complex."

The relation of ingested carbohydrate to the type and amount of blood and urine sugar and to the incidence of cataract in rats, H. S. Mitchell, O. A. Merriam, and G. M. Cook (*Jour. Nutr., 13 (1937), No. 5, pp. 501–511*).—In continuation of previous studies (E. S. R., 76, p. 573) from the Massachusetts Experiment Station, the authors describe tests made on rats receiving adequate rations containing 62 and 70 percent lactose, 25 and 35 percent galactose, 35 fructose, 35 xylose, and 70 percent starch. Blood sugar determinations were made daily by the Benedict microcolorimetric method, and the total and nonfermentable sugar contents were determined on 24-hr. urine specimens.

The total blood sugar and the nonfermentable urine sugar values were found to be above normal in all the test animals, with the maximum value shown by the rats receiving the galactose-containing ration. The fermentable fraction of the urine sugar remained within normal limits. No hyperglycemia or eye changes were found in animals receiving a fructose-starch ration. A slight elevation in blood sugar and some early transitory lens changes were brought about by the xylose-starch ration. The lactose and galactose rations produced a galactosuria. From the results "it may be concluded that galactose is the sugar responsible for both the high blood and the high urine sugars observed in rats fed on lactose and galactose rations, and must be the major etiological factor in this type of cataract."

Influence of protein or cystine intake on cataract-producing action of galactose, H. S. Mitchell and G. M. Cook (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 806–808*).—In this contribution from the Massachusetts Experiment Station, data are presented to show that a protein deficiency definitely hastens the development of the galactose cataract described in a previous paper (E. S. R., 76, p. 573). Negative results were obtained in tests on cystine except at the higher levels of 1, 2, and 3 percent, when it appeared to have a slight inhibitory effect upon the cataract-producing action of the 25-percent galactose ration.

Determination of vitamin C in the living organism, H. Rotter (*Nature [London], 139 (1937), No. 3521, p. 717*).—A simple qualitative test for vitamin C saturation, based upon experimental work with guinea pigs and clinical work with human patients, is described briefly.

By means of a 1 cc tuberculin syringe a 1/400 normal sterile solution of 2,6-dichlorophenolindophenol is injected into the forearm in such a way as to produce a bubble of about 2 mm diameter and the time noted for the disappearance of the color of the dye. A decoloration time of about 5 min. is said to indicate saturation, of more than 10 min. deficiency of vitamin C. Decoloration times between 5 and 10 min. indicate a normal content of vitamin C of the body.

The vitamin C level of the blood during menstruation [trans. title], W. Neuweiler (*Klin. Wchnschr., 16 (1937), No. 26, pp. 926, 927, figs. 4*).—The blood of three healthy women from 20 to 30 yr. of age was tested every 2 or 3 days during two menstrual cycles for vitamin C by titration with 2,6-dichlorophenolindophenol according to the method of Van Eekelen and Emmerie (E. S. R., 76, p. 155). A fourth subject was tested through one menstrual cycle. All the subjects were on approximately the same diet and were tested during the same season to avoid differences in vitamin C intake. The curves for ascorbic acid values in milligrams percent showed the natural fluctuations to be expected on a diet not absolutely controlled, but no significant or consistent differences could be attributed to menstruation.

The diuretic action of vitamin C, M. A. Abbasy (*Biochem. Jour., 31 (1937), No. 2, pp. 339–342, fig. 1*).—In earlier work on the excretion of vitamin C by human subjects (E. S. R., 74, p. 888), it was noted that the volume of urine excreted appeared to be significantly larger after the administration of large doses of ascorbic acid. These observations have been confirmed by quantitative studies under controlled conditions of a group of hospitalized children—10 active rheumatics, 10 convalescent rheumatics, and 10 controls, most of whom were cases of congenital deformity. The urine of each patient was examined for its total volume and vitamin C content during 2 days in which no ascorbic acid was administered and for the following 3 days in which a test dose of 700 mg of ascorbic acid per 10 stone (140 lb.) body weight daily was given.

A marked increase in urinary volume occurred whenever there was a definite response to the vitamin, as shown by increased excretion. In the controls, who were in a normal state of vitamin C metabolism as judged by the prompt response to the test dose of ascorbic acid, the diuretic effect occurred almost immediately. It is suggested that ascorbic acid might be of value as a mild diuretic, particularly when infection is present.

Rôle of vitamin C in resistance, D. Perla and J. Marmorston (*Arch. Path., 23 (1937), Nos. 4, pp. 543–575; 5, pp. 683–712*).—This extensive review is presented in sections dealing, respectively, with the effect of a deficiency of vitamin C on the formation of natural antibodies, the formation of specific antibodies, skin sensitization and anaphylaxis, natural resistance to poisons and toxins, natural resistance to spontaneous infections, and natural resistance to experimentally induced infections; the effect of excess vitamin C on natural resistance to toxins, spontaneous infections, and induced infections; the importance of vitamin C in the maintenance of normal tooth growth; and interpretation of the role of vitamin C in resistance. The literature references, totaling 142, are given as footnotes.

Investigation of the serum ascorbic acid and vitamin C storage in four cases of clinically manifest hypovitaminosis [trans. title], H. Lund, H. Lieck, T. K. With, and S. Clemmesen (*Klin. Wchnschr., 16 (1937), No. 21, pp. 748–750*).—Using the micromethylene blue titration method previously noted (E. S. R., 77, p. 742), the authors have determined the ascorbic acid content of the blood serum of a number of healthy subjects and have demonstrated the usefulness of the method in detecting hypovitaminosis and following the course of treatment with ascorbic acid.

The tests on the healthy subjects were given after a light morning meal. A single dose of ascorbic acid in amounts of 10 mg per kilogram of body weight was given by mouth and the capillary test made 2 hr. later. Among the 21 subjects, only one value (0.8 mg per 100 cc) fell below 1 mg per 100 cc, the others ranging from 1.2 to 2.4 mg. In the four cases of C hypovitaminosis studied, the first ascorbic acid values obtained were 0, 0.16, 0, and 0.24 mg per 100 cc, respectively. Ascorbic acid was then administered in amounts of 200 mg daily, with an occasional test dose of 600 mg in an attempt to saturate the tissues. Saturation was accomplished in the first three subjects after a total ingestion of ascorbic acid of 9.5, 7, and 14.4 g, respectively, during periods of from 2 to 5 weeks. The third showed an inability to absorb vitamin C from the intestinal tract, for the serum content could not be raised higher than 0.4 mg after repeated doses by ingestion but was raised satisfactorily following an intravenous injection and to a lesser degree following an intramuscular injection. The rise in serum content of ascorbic acid was accompanied by improvement in the general symptoms.

Experimental alveolar bone atrophy produced by ascorbic acid deficiency and its relation to pyorrhea alveolaris, P. E. Boyle, O. A. Bessey, and S. B. Wolbach (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 733–735*).—Incisor and molar teeth and surrounding tissues obtained from a large number of guinea pigs maintained for periods up to 6 mo. on a vitamin C-free diet supplemented by increased amounts of from 0.3 to 5 mg of ascorbic acid per day were studied to determine the influence of a chronic vitamin C deficiency. The histological findings were identical with those found in humans having the diffused atrophy type of pyorrhea, which is due to the inability of the peridental tissue to withstand functional stress.

The antiscorbutic properties of a salt of iron and ascorbic acid, M. Pijoan (*Science, 86 (1937), No. 2221, pp. 80, 81*).—It is noted briefly that a salt of reduced iron and *l*-ascorbic acid in use for the treatment of secondary anemias has been found to have a highly antiscorbutic property when given daily over a period of 6 days to a patient with severe scurvy. A daily dose of 250 mg sufficed to bring the plasma ascorbic acid level from 0.02 mg percent to 1.2 mg percent, with relief of the scorbutic symptoms.

In tests with normal subjects, it was found that after intravenous injection the rise in plasma ascorbic acid was much more gradual than when the same amount of ascorbic acid alone was injected. This is an indication that the compound of iron ascorbate breaks down slowly. In chemical tests 97 percent of the ascorbic acid was recovered after precipitating iron with hydrogen sulfide. The salt contains 20 per cent iron and in a 1-M solution has a pH of 6.9.

Comparison of the antirachitic effects on human beings of vitamin D from different sources, T. G. H. Drake (*Amer. Jour. Diseases Children, 53 (1937), No. 3, pp. 754–759*).—Observations on the basis of roentgenograms of the wrists made on 1,228 infants during a 5-mo. period showed no evidence of any difference in the antirachitic effect in human beings, rat unit for rat unit, of vitamin D given in the form of cod-liver oil, a mixture of fish-liver oils of high potency, irradiated cholesterol, irradiated fresh milk, or irradiated evaporated milk, nor between the daily administration of 150 U. S. P. units of vitamin D in any of these forms and of 270 U. S. P. units in the form of viosterol. The administration of about 95 U. S. P. units of vitamin D daily prevented the development of rickets of a moderate or marked degree, while 300 U. S. P. units in the form of irradiated cholesterol or 500 U. S. P. units in the form of irradiated yeast daily brought about rapid healing of rickets.

Importance of the liver for the antirachitic efficacy of vitamin D, W. HEYMANN (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 812–814*).—From a study of the antirachitic efficacy of vitamin D in rachitic rats with an obstructive biliary cirrhosis or a liver damage by the administration of carbon tetrachloride, it is shown that jaundice does not lead to an impairment of the calcifying function of the osteogenic cells, nor does it interfere with the adsorption of viosterol at the site of injection. It is concluded that the decreased antirachitic potency of vitamin D in the test animals was due to the impaired liver function.

Sprue and vitamin deficiency, L. NICHOLLS (*Ceylon Jour. Sci., Sect. D, Med. Sci., 3 (1934), No. 3, pp. 173–176*).—From the results of a survey made on over 3,000 school children of the poorest class living in India and from the observations of other investigators, the author concludes that sprue is a deficiency disease, not caused by a dietary deficiency but "due to various causes producing a preliminary damage of the epithelium of the small intestine, which lowers its capacity to absorb the necessary vitamins, and this may lead to impairment of the metabolic assimilation."

Amino acids (natural and synthetic) as influencing hemoglobin production in anemia, G. H. WHIPPLE and F. S. ROBSCHEIT-ROBBINS (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 629–632*).—Data are presented to show that histidine and phenylalanine, both in the natural and synthetic form, may under certain conditions exert a definite influence upon the regeneration of red cells and hemoglobin in standardized dogs made anemic by blood withdrawal.

Production of canine blacktongue on purified diets, H. R. STREET (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 602, 603*).—Results are presented to show that blacktongue is due to a lack of some water-soluble dietary factor or factors of the vitamin B complex other than vitamins B_1 and B_2, thus confirming the findings of Birch et al. (E. S. R., 76, p. 423).

Nature of diet in its relationship to control of dental caries, J. D. BOYD, C. L. DRAIN, and G. STEARNS (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 5, pp. 645, 646*).—In continuation of a previous study (E. S. R., 62, p. 595), this report correlates the response of the teeth with the level of intake of certain dietary constituents. Five children aged from 3 to 6 yr. were observed for 7 mo. under varying intakes of vitamin D, with dental examinations and balance studies made at frequent intervals. Several dietary regimes were used progressively, each for a period of from 5 to 8 weeks.

The activity of the caries determined on the basis of the permeability of the exposed dentine to the exploring tine showed that two had active caries, one a small proximal cavity, and the other two were free from demonstrable tooth decay. The caries was arrested at the end of 7 mo., during which time a diet of high protective value aside from its vitamin D content had been taken, together with cod-liver oil supplements during the last 9 weeks of the period.

Observations also were made on an 11-year-old boy upon whom the effects of vitamin A intake were being judged by dark adaptation. Maintenance on a diet low in the protective foods and supplying very little of the vitamins A and D resulted in a slight increase in the extent of dental caries, and the condition was not arrested until after 9 weeks of viosterol administration. It is concluded that the level of vitamin D was the determining factor.

Effect of sunlight on the clinical manifestations of pellagra, D. T. SMITH and J. M. RUFFIN (*Arch. Int. Med., 59 (1937), No. 4, pp. 631–645, figs. 5*).—The suggested relationship of pellagra to the action of sunlight on the exposed surfaces of the body was studied on 35 hospitalized patients with moderately

severe clinical pellagra. A basic diet, which had produced blacktongue when fed to dogs, consisting of corn meal, cane sirup, flour, lard, rice, field peas, hominy grits, and fat salt pork supplemented by cod-liver oil, tomato juice, ammonium citrate and iron, calcium gluconate, and cheese, was fed to 25 patients, and for the remaining 10 the tomato juice was replaced by 90 g of cevitamic acid.

The administration of the diet and protection from the direct rays of the sun resulted in improvement of the cutaneous lesions, and in some cases the constitutional symptoms also subsided. After the preliminary period of observation one hand and forearm or the corresponding foot and lower portion of the leg were exposed to the direct sun's rays on from 3 to 5 consecutive days for from 20 to 30 min. the first time and increasing by 15 min. each day up to a maximum exposure of 1 hr. Dermatitis appeared over the exposed areas in 13 cases, and 2 showed constitutional symptoms. The condition of the tongue became definitely worse in 12 of the patients, with diarrhea present in 10, nausea in 7, vomiting in 6, anorexia in 8, and dementia in 4 cases. Eleven of the patients were re-exposed to maximum doses of sunlight following adequate treatment and did not develop cutaneous lesions or any of the general symptoms of pellagra.

It is concluded that the "exposure of a susceptible subject who has been subsisting on a deficient diet to the sun's rays precipitates the acute manifestations of pellagra."

Hypo-adrenalism and pellagra: The rôle of vitamin deficiency, I. M. Sclare (*Brit. Med. Jour., No. 3989 (1937), pp. 1249–1251*).—A case history is presented to show that vitamin B_2 deficiency is not the sole causative factor of pellagra. It is suggested that the avitaminosis is an accessory cause, and that the fundamental etiological factor in pellagra is hypoadrenalism.

Further studies on the concentration of the antipellagra factor, C. J. Koehn, Jr., and C. A. Elvehjem (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 693–699, fig. 1*).—In this contribution from the Wisconsin Experiment Station the authors describe a method for the further purification of the antipellagra factor, the preparation of which has been described previously (E. S. R., 74, p. 885). The amyl alcohol solution equivalent to 400 g of liver extract was concentrated to dryness, and the residue was dissolved in 100 cc of 95 percent alcohol, twice extracted with acetone, and the insoluble inactive material filtered off. After concentration to dryness and desiccation the solid matter was extracted with 50 cc of water, and much of the undissolved inert material was filtered off and washed. The combined filtrate and washings were diluted to 200 cc and shaken with 2 g of norite, which was filtered off and washed with water. The combined filtrate and washings were colorless and contained 2.56 g of active dry matter.

Following the technic of Kline et al. (E. S. R., 69, p. 844), chicks maintained on ration 240-H all showed pellagra-like symptoms and a definite retardation of growth at 3 weeks of age, whereas the chicks receiving the concentrate equivalent to 5 percent of the original liver extract, or approximately 0.7 mg daily, showed neither lesions nor weight losses. "Thus at least 40 percent of the vitamin present in the original liver extract was recovered in the concentrate, since 2 percent liver extract is required to protect chicks on this ration." Dogs receiving diet 323 of Goldberger et al. (E. S. R., 63, p. 491), with the cowpeas omitted and calcium supplied in both calcium carbonate and calcium phosphate, generally developed blacktongue within from 6 to 8 weeks and at this time were given the first dose of the preparation by pipette. After the first treatment the dogs' appetites improved and 64 mg of the preparation was added to the ration daily. The dogs appeared quite normal after 3 days of treatment.

"Although we must not overlook the possibility that there may be two closely related factors, one active in chicks and one in humans, the fact that a purified concentrate cures both chick pellagra and canine blacktongue is strong evidence that we are dealing with one factor."

The relationship between selenium poisoning and pellagra [trans. title], R. DE ROHAN-BARONDES (*Presse Méd. [Paris], 45 (1937), No. 11, pp. 188–190*).—Symptoms of selenium poisoning in animals are compared with those of pellagra in dog and man and are shown to be strikingly similar, particularly in the changes in the gastrointestinal tract, the mental and nervous disorders, and the occurrence during the late fall season.

A dietary study in rheumatic fever, S. E. SADOW, J. P. HUBBARD, and T. D. JONES (*New England Jour. Med., 217 (1937), No. 5, pp. 170–173, figs. 2*).—Thirty-one hospitalized children with rheumatic fever were given a special high caloric diet containing all the essential nutritional elements, including vitamins A, B complex, C, and D for an average of 20 weeks. A control group of 25 children received the usual hospital diet, which was about 38 percent lower in caloric value and contained 10 cc of cod-liver oil daily as the sole vitamin supplement and no vitamin-rich foods. The subjects varied in age from 3½ to 18 yr.

Although the experimental group showed a significant increase in the rate of weight gain, no observable difference was found in the course of the disease. However, gain in weight is desirable, and it is recommended that a high caloric diet containing all the known important food elements should be given to children subject to or suffering from rheumatic fever.

The metabolic background of rickets: An interpretive review, R. GUBNER (*New England Jour. Med., 216 (1937), No. 20, pp. 879–887*).—The author reviews the structural bone changes, the disturbances of calcium and phosphorus metabolism, and the role of vitamin D, the parathyroid glands, and the enzyme phosphatase in the pathogenesis of the disease rickets.

The significance of plasma phosphatase in the diagnosis and prognosis of rickets, N. MORRIS, M. M. STEVENSON, O. D. PEDEN, and J. M. D. SMALL (*Arch. Disease Childhood, 12 (1937), No. 67, pp. 45–58, figs. 3*).—From plasma phosphatase values obtained on a group of 506 infants and children under 2 yr. of age, with and without positive clinical or X-ray findings of rickets, the authors conclude that so far as blood examination is concerned plasma phosphatase is probably the most delicate test of rickets. However, the phosphatase value alone should not be regarded as conclusive evidence of the presence or absence of rickets. The height of the plasma phosphatase cannot be used as a means of comparing the severity of rickets in different patients, but it is of value in estimating the recovery process in the same patient. Fairly close associations were found between phosphorus and phosphatase values and between calcium-phosphorus product and phosphatase.

In 4 cases of untreated rickets the changes in plasma phosphatase were observed over periods of from 1 to 3 weeks. The skiagrams showed evidence of continued activity of the rachitic process while the phosphatase increased in value. The administration of vitamin D prevented the increase in phosphatase and in from 2 to 3 weeks the value decreased, the rate of fall depending upon the dosage of vitamin D and being much more rapid with large amounts. On ordinary therapeutic doses of vitamin D normal limits of phosphatase value may not be reached for over 3 mo. It is suggested that when the supply of calcium does not meet the demand of the bone cells the plasma phosphatase rises.

Cereals and rickets.—VIII, The hydrolysis of phytin in the intestine, J. T. Lowe and H. Steenbock (*Biochem. Jour., 30 (1936), No. 11, pp. 1991–1995*).—In continuation of this series of studies at the Wisconsin Experiment Station (E. S. R., 77, p. 282), the authors determined the availability of phytin when adult rats were given the Steenbock-Black rickets-producing ration 2965 in which the calcium carbonate had been omitted and disodium hydrogen phosphate or phytin prepared from wheat bran and free from any inorganic phosphorus had been added. The results show that phytin-phosphorus is not completely unavailable to the rat, but that the small amount which might be available is rendered almost completely unavailable in the presence of calcium carbonate or of salts of beryllium, strontium, aluminum, iron, and magnesium substituted for it. No significant change in the excretion of phosphorus was noted when the basal ration was modified by substituting rolled oats or whole wheat for yellow corn, adding 10 percent of lactose or 30 percent of lard, or supplementing the ration by 1,250 U. S. P. vitamin D units daily. Since variability in the utilization of phytin-phosphorus may be a factor in explaining the irregularities reported in the literature in the production of experimental rickets, the ratchitogenic diets used for assays should contain the phosphorus in the form of compounds of invariable nutritive value.

HOME MANAGEMENT AND EQUIPMENT

Studies in farm family living (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 41–44*).—This report on the extensive investigation by the Bureau of Home Economics on family consumption according to income contains data on the range of total net income and net money income of the 32 groups of farm families representing regional types of farming in 21 States and the general trends of expenditures of these families. The food habits of nonrelief families in cities and villages are also discussed with reference to supplying enough food to the large undernourished group of the population of the entire country.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1937, H. A. Wallace (*U. S. Dept. Agr., Sec. Agr. Rpt., 1937, pp. 111+115*).—The principal findings in this report are noted elsewhere in this issue.

Annual report of the director [of the Delaware Station] for the fiscal year ending June 30, 1937, C. A. McCue et al. (*Delaware Sta. Bul. 207 (1937), pp. 46*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report of the Pennsylvania Agricultural Experiment Station, [1937], [R. L. Watts et al.] (*Pennsylvania Sta. Bul. 352 (1937), pp. X+69, figs. 8*).—In addition to a review of the station's work and development since its establishment, progress reports are given of the year's accomplishments, the experimental data being for the most part noted elsewhere in this issue. Meteorological data, by J. S. Cobb and C. A. Kern (pp. 67, 68), are also included.

Report of the Puerto Rico Experiment Station, 1936, [A. Lee] (*Puerto Rico Sta. Rpt. 1936, pp. [2]+103, figs. 18*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Alabama Station.—A new cotton research laboratory has been fitted up in cooperation with the U. S. Department of Agriculture. The objective is to determine the effect of variety, fertilizers, moisture, and other field conditions on the size, boll, length of lint, protein and oil content of seed, and the efficiency, maturity, distribution, and breaking strength of cotton fibers.

Arkansas University and Station.—A livestock and forestry branch station has been recently established by State action. It consists of 3,000 acres of land near Batesville in Independence County and was established to develop a system of farming adaptable to the profitable use of lands in the eastern Ozark section with gentle to steep slopes and low or depleted fertility and not now suitable for row crop production. Its research program will be developed along the major lines of livestock and forestry. W. C. Wilbanks, formerly county agent of Marion County, has been appointed assistant director in charge, with Chester F. Williams as technical assistant.

Additional buildings to provide living quarters for technical assistants and laborers have recently been constructed in the three remaining branch stations. L. C. Carter has been appointed assistant director in charge of the Rice Branch Station vice G. H. Banks resigned to enter commercial work. J. A. Russell, technical assistant at the same branch station, has resigned to accept a position with the U. S. D. A. Soil Conservation Service and has been succeeded by Max G. Weir.

Other resignations in the institution include Dr. William L. Bleecker, professor and head of the department of bacteriology and veterinary science since 1918, and Dr. L. M. Turner, assistant professor of forestry, who has accepted a position with the U. S. D. A. Southern Forest Experiment Station.

California University and Station.—An administrative reorganization of the College of Agriculture has been effected, under which the names of the Branch of the College of Agriculture at Davis and the Branch of the College of Agriculture in Southern California have been discontinued, as well as the titles of director for these subdivisions. Dr. W. H. Chandler, resident at Los Angeles, and K. A. Ryerson, resident at Davis, have been now appointed assistant deans, and Dr. S. B. Freeborn, resident at Berkeley, assistant dean and assistant director of the station. Dr. L. D. Batchelor remains as director of the Citrus Experiment Station at Riverside, which will be under the general supervision of the assistant dean at Los Angeles.

The regents have authorized the construction at Davis of a hydraulics laboratory for the joint use of irrigation and agricultural engineering. Plans are also under way for an oenological laboratory.

Instruction in floriculture and ornamental horticulture has recently been authorized, with headquarters in connection with the College of Agriculture at Los Angeles. This location is in recognition of the extensive seed propagation industry on the south coast and the magnitude of the nursery business in southern California.

Dr. Siegfried von Ciriacy-Wantrup has been appointed assistant professor of agricultural economics, assistant agricultural economist in the station, and

assistant agricultural economist on the Giannini Foundation of Agricultural Economics.

Iowa College.—The I. S. C. Agricultural Foundation has been established with a board of trustees consisting of President Charles E. Friley, Dean H. H. Kildee, Extension Director R. K. Bliss, and Deane W. Trick, C. R. Musser, and J. H. Anderson, with George W. Godfrey as secretary. A gift from an anonymous source has been received of nine farms, as well as funds for maintenance. The articles of incorporation provide for "(1) developing practical, economical, and profitable methods of cultivation and management of ordinary or family-sized farms, (2) determining the crops best adapted and most profitable to be grown in the various sections of Iowa, (3) determining the types, breeds, and classes of livestock to be produced and used on the farms of the various sections of the State, including care, breeding, and feeding, (4) conserving and building up the soil and natural resources of such farms, (5) developing the social, educational, and religious environment of those engaged in agriculture in the localities where such farms may be located, (6) improving the conditions of social and family life, (7) publishing and disseminating the information and the results obtained."

Louisiana University and Station.—The university has bought 237 acres of land about 4 miles from its campus for the use of the station. This land will be used as a site for the experimental poultry plant and by the department of crops and soils. Its purchase will also release land of similar type now being used by the department of crops and soils for reassignment to the departments of entomology and horticulture.

The university has completed a pavilion 352 by 219 ft., which will be known as the farm center. Rooms are to be built under the seats of the pavilion and used for station laboratories and offices by the departments of crops and soils, horticulture, entomology, poultry research, the feed and fertilizer laboratory, and certain cooperative work with the U. S. D. A. Bureau of Entomology and Plant Quarantine and the Bureau of Plant Industry.

Maryland University and Station.—Farm properties located about 18 miles north of Baltimore and valued at more than $1,000,000 have been given the university by Charles E. McManus. The gift also includes a herd of Ayrshire cattle, a large number of other livestock, and over 100,000 chickens. No conditions were attached to the gift other than that the property or any proceeds therefrom are to be used solely for the benefit of agriculture.

Sidney W. Wentworth, associate professor of horticulture and associate pomologist from 1928 to 1937, died January 10 at the age of 44 years. He was a native of New Hampshire, receiving the B. S. degree from the University of New Hampshire in 1917 and the M. S. degree from Cornell University in 1929. He had given special attention to apple growing, serving as assistant professor of horticulture and assistant horticulturist in the New Mexico College and Station in 1920 and as instructor and assistant professor and assistant pomologist in New Hampshire from 1920 to 1928. He was a veteran of the World War, rising to the grade of captain in the U. S. Marine Corps after service on the U. S. S. *Nevada* in the submarine zone.

Dr. H. B. McDonnell, professor of agricultural chemistry, and Dr. W. T. L. Taliaferro, professor of farm management, have retired. Dr. C. H. Mahoney, assistant professor of horticulture (extension) and research associate horticulturist in the Michigan College and Station, has been appointed professor of olericulture, giving the major portion of his time to the station work.

Michigan College and Station.—A trust endowment of $500,000 for agricultural and chemurgic research has been made to the station by the Horace H.

Rackham and Mary A. Rackham Foundation of Detroit. The income from this endowment is to be administered by a special board of five trustees, of whom two are President R. S. Shaw of the college and Director V. R. Gardner of the station. Tentative plans contemplate a study looking toward the finding of new industrial uses for farm products, such as the development from straw or cornstalks of a material that can be incorporated with the soil, permanent or semipermanent in nature, which will increase its porosity, give it a more spongy texture, and serve to increase its water-absorbing and water-holding capacity.

Dr. A. F. Yeager, chairman of the department of horticulture and forestry of the North Dakota College and Station, has succeeded Dr. C. H. Mahoney as research associate and extension specialist in horticulture. Other appointments in the station include L. H. Greathouse as research associate in agricultural chemistry and E. J. Benne and D. W. Hayne as research assistants in agricultural chemistry and zoology.

Missouri University and Station.—A grant of $2,500 from the International Cancer Foundation has been accepted to extend investigations on hormones as related to mammary tumor production now carried on in the department of dairy husbandry.

The station is cooperating with the U. S. D. A. Bureau of Animal Industry and the regional swine improvement laboratory at the Iowa State College in a study of swine improvement by breeding methods. The general plan of the project will be to practice modern inbreeding and rigid selection in an attempt to develop superior strains. A genetic and physiological study of some characters will also be made. L. A. Weaver and Ralph Bogart will be in direct charge of the work, and a 120-acre tract of land has been purchased by the station for use in the study.

Dr. Ezra L. Morgan, professor and chairman of the department of rural sociology since 1921, died October 12, 1937, at the age of 58 years. A native of Illinois and a graduate of McKendree College in 1904, he was then engaged in Y. M. C. A. work in Kansas until 1910. He received the M. A. degree from the University of Wisconsin in 1912 and the Ph. D. degree from the Massachusetts College in 1932. He served as extension professor of rural organization in the latter institution from 1912 to 1919, carrying on much pioneer work in the field of community organization. He then became national director of rural service in the American Red Cross, with which he was later connected as rural advisor to the southwestern division. Dr. Morgan will be succeeded on June 13 by Dr. Charles E. Lively, associate professor of rural economics in the Ohio State University and associate in rural economics in the Ohio Station.

Florence Harrison, dean of the College of Home Economics in the Washington College, has been appointed head of the department of home economics, effective September 1. Dr. Frank H. Olvey has been appointed instructor in veterinary science and assistant in the station.

Clemson College.—A new textile building, costing about $465,000, is expected to be completed for the 1938 fall session. It is a four-story building with about 30,000 sq. ft. of floor space.

EXPERIMENT STATION RECORD

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WILLIAM PENN BROOKS OF MASSACHUSETTS AND JAPAN

The career of Dr. William Penn Brooks, who died in Amherst, Mass., on March 8, 1938, is associated with two widely separated institutions—his Alma Mater, the Massachusetts State College, and the Sapporo Agricultural College, now the Hokkaido Imperial University of Japan. To each he rendered a unique and worthy service.

Born in South Scituate, Mass., on November 19, 1851, Dr. Brooks was valedictorian of the class of 1875. A year of graduate work followed, supplemented long afterward by his receipt of the Ph. D. degree from the University of Halle in 1897. His active service began in 1877 in Japan, where he joined President W. S. Clark of Massachusetts, who had recently organized the first agricultural college in the Orient. Dr. Brooks served as professor of agriculture and director of the college farm, taught botany, and was acting president from 1880 to 1883 and again from 1886 to 1887.

Dr. Brooks' work in Japan was highly regarded. On his departure he was decorated with the Fourth Order of the Rising Sun, and in 1919 an honorary degree, Nogaku Hakushi (Learned in Agricultural Science), was conferred upon him by the Japanese Department of Education.

Returning in 1889 to Massachusetts, he became professor of agriculture and agriculturist in the experiment station, and continued in these capacities for 30 years. He was also acting president of the college in 1903 and in 1905–6, director of the Massachusetts Experiment Station from 1906 to 1918, and then consulting agronomist until his retirement in 1921. In 1928 he was designated emeritus professor of agriculture.

Dr. Brooks brought back with him a number of useful plants, among them barnyard millet and two other Japanese millets and several types of Japanese soybeans. One of his distinct achievements was his pioneer experimenting with these soybeans and their utilization.

His extensive studies with soils and fertilizers became widely known, and he was a frequent speaker at Farmers' Institutes on these subjects. He was also the author of a series of books on agriculture,

first published in 1901 and extensively used as texts in resident and correspondence courses and as a reference work by farmers.

Thus he led a very useful life. Both in Japan and Massachusetts he was turned to in times of emergency, often under very difficult circumstances, and he responded dependably and with scrupulous particularity. Following as he did such men of genius as Clark and Stockbridge and Goessmann, he showed himself a worthy disciple, not only continuing and corroborating much that they had begun but adding a substantial individual contribution.

COMPARATIVE EXPENDITURES FOR AGRICULTURAL AND INDUSTRIAL RESEARCH

According to data recently complied by Mr. Howard P. Barss of the Office of Experiment Stations and available in microfilm or photoprint form as Document 1062 from the American Documentation Institute, the total research expenditures in the United States in industries and agriculture combined now average about $2 per capita per annum. This is a little more than 1 ct. per dollar of income from these sources. Of this amount the estimated allotment for industrial research in 1937 was $250,000,000, while for agriculture the appropriations for the fiscal year ended June 30, 1937, were $35,699,299. This is in the approximate ratio of 7:1.

The gross income from manufactures for 1936 is estimated at $14,690,000,000, while the cash farm income for the year is put at $8,100,000,000. Home-consumed farm products raise the latter total to $9,530,000,000. Thus the relative support for industrial research is 1.7 percent of the gross income and that for agriculture is 0.37 percent. On this basis the relative expenditure is about 9:2.

The disparity is the more significant in that the industrial research is financed directly by the industries themselves, while the agricultural research is for the most part supported by Federal and State appropriations. Since the profit-seeking motive undoubtedly underlies the industrial expenditures, it does not seem probable that research in this field is being maintained extravagantly. If we assume that the needs and opportunities are proportionately as great in agriculture, the conclusion seems warranted that argriculture has not been unduly subsidized by what has been done thus far in this direction.

Correspondence received in connection with the inquiry revealed that many industrial concerns are investing in chemical research alone from 2 to 7 percent of the returns from their gross sales. It is stated that "even during depression times there were in the United States approximately 1,600 industrial research laboratories with more than 22,000 technically trained men and women at work."

The heavy expenditure is justified by its sponsors on the ground, as expressed by one manufacturer, that research not only "stabilizes and improves industry, but it actually creates new types of business. . . . During the current year, chemical manufacturers alone will spend at least $20,000,000 and process industries several times this total. . . . Research creates. . . . The result is human benefit . . . worth many times the immediate cost in dollars and cents." As another puts it, "for American chemical industries research has increased production and yields, improved product, created new industries."

It is of interest to note that when attempting to evaluate industrial research a long-time view is taken. One automobile manufacturer says frankly that "as to the success of research projects, our experience has been that one important development every few years is a good batting average." He elaborates this idea further by saying that "research activities in general do not produce anything except ideas and therefore cannot be placed on any sort of production accounting basis." The point is, however, that "when a specific development is made, the sales value of which can be determined on a dollar and cents basis, we usually find that one good one will pay the cost of operating the laboratories for quite a long time. Anything else, whether tangible or intangible from the standpoint of accounting, is return on the investment."

The applicability of some of these findings to agricultural research will be readily apparent. They help to explain the reluctance of many research directors to attempt a computation of profits from their work whether derived from new findings in disease control, plant or animal improvement, or better farm practice. Precise measurement in dollars and cents of many of these benefits will seldom be feasible. Nevertheless there is evidence a-plenty that in the long run agricultural research pays good returns, perhaps as richly as any public expenditure. Merely as a defense against some of the hazards to which farming in the past has been subject the maintenance of adequate agricultural research agencies is doubtless abundantly worth while. And though their potential value as to future discoveries may be intangible, there are infinite possibilities.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical research work of the Bureau of Chemistry and Soils, 1937] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1937, pp. 3–34*).—The year's progress is summarized under the headings of sugars, sugarcane, and sugar beets; farm-made sirups; honey; sweetpotato starch; cellulose; citrus fruit products; deciduous fruit products; vegetables and vegetable products; staling of bakery products; gluten bread; the acid-base balance of cereals and related foods: rancidity; loosening the hulls of walnuts; enzyme investigations, including eggs and egg products and dressed poultry; waxlike coatings of fruits; fruit skins; apple pigments; plant viruses; toxicity of insecticides to higher animals; hides and skins; tanning materials; leather; utilization of farm wastes; lignin; corn fermentation products; industrial utilization of soybeans; sodium chlorate; naval stores; liquid wax from jojoba beans; oil from nuts of Japanese "wood-oil" tree, the lumbang or candlenut tree, and fruit seeds of the Brazilian palm; phosphatides of soybean oil; proteins of wheat and the black beans of the Mayas; tryptic digestion of casein; decystinized casein; selenium in toxic wheat; effect of storage on proteins of soybean oil meal; the vitamin B complex in soybeans; allergens from milk, ragweed, cotton linters, and cottonseed; the spontaneous ignition of hay; dust explosions; and suffocation from silo gas.

[Chemical and bacteriological investigations at the New York State Station] (*New York State Sta. Rpt. 1937, pp. 19, 20, 21, 27–29, 31, 32, 33, 38, 39*).—These have included work on fruit juices, including wine making and oxidized flavors in wines, pasteurization temperatures for rhubarb and cherry juice, preparation of cider and beverages from Montmorency cherries and rhubarb, and varieties suitable for maraschino cherries; the lactobacilli; the molecular size of natural pectin; pectic enzymes of tomatoes; lead in maple sirup; manufacture of protein plastics; and influence of salts on the properties of gelatin.

The determination of contact angles from measurements of the dimensions of small bubbles and drops, I, II (*Jour. Phys. Chem., 40 (1936), No. 2, pp. 159–167, fig. 1; pp. 169–176, figs. 6*).—These two papers open a serial contribution from the New York State Experiment Station.

I. *The spheroidal segment method for acute angles*, G. L. Mack.—The author calls attention to the fact that "the present methods of measuring contact angles all require that the solid material be obtainable in some special shape, such as a flat plate or capillary tube. Many surfaces, for example, those of plant materials, occur in irregular forms and must be dealt with in situ because of the inhomogeneity of the body." The following procedure obviates this serious drawback:

"The solid to be investigated was imbedded on a paraffined glass plate. The liquid was placed in a short length of glass tubing, one end of which had been drawn out into a very fine capillary. A spiral in the capillary tube facilitated the manipulation of the tip. Drops of the liquid were formed slowly on the tip by gravitational force. By touching the glass tip to the solid surface at

definite time intervals, drops of a constant and reproducible size were detached. Ten or more drops were measured at a time, so that each determination yielded a truly average result. To minimize evaporation the solid and supporting plate were enclosed in a low form weighing bottle. The cover of this bottle was fitted with a window of optically plane glass. The diameters of the drops were observed through this window in the ocular scale of a low power microscope. The volume of liquid used for a given number of drops was obtained by measuring the difference in height of the liquid in the upper part of the glass tube before and after the drops were removed. Since the diameter of the tube was known, the cylindrical volume could be calculated."

The validity of the method has been checked by repeating the determination of the contact angles upon the same materials by two different methods. Satisfactory agreement was obtained in all cases.

II. *The sessile drop method for obtuse angles*, G. L. Mack and D. A. Lee.—The authors note widely variant surface energies which may occur at closely adjoining points, and call attention to the fact that "instead of measuring the contact angle directly, it may be calculated from the dimensions of the drop. The angle so obtained may be regarded as the integral of the sum of all the various contact angles existing along the circumference of the drop. Thus each determination yields an average result not unduly influenced by irregularities at a given point on the surface." The authors accordingly propose a method for determining obtuse contact angles from measurements of three dimensions of sessile drops of bubbles under a plate. These dimensions are the vertical height z, the horizontal radius r, and the radius of curvature b at the apex of the curved surface. A simplified equation for calculating the value of b from that of the capillary constant of the liquid is given. The equation

$$\frac{b}{r} = 1 + \frac{1}{3}\frac{r^2}{a^2}$$

is shown to be "amply sufficient for the present purpose."

The proposed method is shown to have several advantages over the direct method of measurement with a protractor.

Heterogeneous equilibrium of protein solutions.—I, Activity coefficients and membrane equilibrium in mixtures of gelatin and salts, N. R. Joseph (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 353–370, figs. 2*).—The author shows the development of thermodynamic equations which correlate the osmotic properties of three component systems with the activity coefficients of the dissolved components. Also, the effect of gelatin on the activity coefficient of zinc chloride was determined electrometrically, the effect of zinc chloride on the activity coefficient of gelatin was calculated, and the salt effect determined electrometrically has been compared with that determined for gelatin by membrane equilibrium and for other proteins by solubility studies.

The results are discussed from the point of view of the interionic force theory as applied to the interaction of ions and zwitter ions.

X-ray diffraction patterns of crystalline tobacco mosaic proteins, R. W. G. Wyckoff and R. B. Corey (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 51–55, pl. 1*).—The patterns obtained at The Rockefeller Institute for Medical Research in a series of X-ray powder diffraction photographs of crystalline tobacco mosaic virus proteins, showing "many sharp reflections between 80 a. u. and 3 a. u., are exactly those to be expected from true crystals composed of large molecules. No differences could be found in the patterns of the proteins of the ordinary and of the aucuba strains of the disease. Neither was there any alteration in the X-ray photograph after nine successive recrystallizations. Tobacco mosaic virus protein completely inactivated by means of ultraviolet irradiation and

subsequently crystallized gave a photograph having principal diffraction lines that are the same as those of the active protein."

Enzymatic hydrolysis of lactalbumin, L. Miller and H. O. Calvery (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 393–408; abs. in Chem. Abs., 31 (1937), No. 3, p. 715*).—The peptide linkage is believed to have been the principal one broken during the peptic hydrolysis of lactalbumin, since amino and carboxyl groups were liberated in equivalent amounts. "The maximal enzymatic hydrolysis of the lactalbumin used in this investigation was obtained with pepsin plus the pancreatic extract and was equivalent to 68 percent of the total nitrogen, or about 94 percent of the linkages broken by acid hydrolysis."

The synthesis of di-N-methylhomocystine and N-methylmethionine and a study of their growth-promoting ability in connection with a cystine-deficient diet, W. I. Patterson, H. M. Dyer, and V. du Vigneaud (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 277–284, fig. 1*).—In the investigation here reported upon, di-N-methylhomocystine and N-methylmethionine were synthesized from benzylthioethylmalonic acid, a compound which was itself synthesized by Patterson and du Vigneaud (E. S. R., 75, p. 293) for use as an intermediate in their synthesis of homocystine. The new syntheses are presented in working detail. It is shown that both of these methylamino acids are able to support the growth of animals on a cystine-deficient diet. The behavior of the keto acids corresponding to homocystine and methionine which may be inferred from these results is pointed out.

The interaction of iodoacetic acid and tertiary amines, M. P. Schubert (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 437–445*).—The author studied the initial velocity of the reaction of iodoacetic acid and of iodoacetamide with a number of amines. "As is to be expected, the speed of this reaction varies greatly with the groups attached to the amine nitrogen. Among the amines studied there are some whose speed of reaction with iodoacetic acid approaches that of the more rapidly reacting thiol compounds. Therefore in studying the effect of iodoacetic acid on enzyme reactions the possibility of reaction with amino groups, particularly tertiary amines, cannot be ignored."

It is also shown that with some types of amines, iodoacetic acid reacts more rapidly than iodoacetamide. These amines thus differ from thiols studied so far, all of which react more rapidly with iodoacetamide.

The reaction of formaldehyde with amino acids, A. Wadsworth and M. C. Pangborn (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 423–436, figs. 2*).—The authors present the results of an investigation, the purpose of which was to obtain data on the behavior of amino compounds of known constitution when treated with formaldehyde under conditions similar to those used for the production of diphtheria toxoid. The following substances were studied: The nine amino acids, glycine, alanine, lysine, cysteine, aspartic and glutamic acids, histidine, tryptophan, and arginine; guanidine; two synthetic dipeptides, alanylglycine and glycylalanine; and peptone and a crude diphtheria toxin.

It was found necessary to modify, for this purpose, the existing methods for determining free formaldehyde. A procedure accurate to about 3 percent when applied to samples containing from 0.4 to 2 mg of formaldehyde was based upon precipitation with dimethyldihydroresorcinol ("methone") within the pH range 4.4–5.0. Quantitative precipitation could not be secured at pH values higher than 5.2.

With respect to the reaction of formaldehyde with the amino acids and related compounds studied, the authors found that "in most cases two stages in the reaction can be demonstrated: (1) A rapid, reversible reaction; (2) a slower, irreversible one." The reversal of the reaction was studied in both acid and alkaline solutions.

The isolation and characterization of a starch polysaccharide from the leaf tissue of the apple tree (Malus malus), C. NIEMANN, A. R. ANDERSON, and K. P. LINK (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 447–455*).—The paper here noted is a contribution from the Wisconsin Experiment Station.

"This polysaccharide was found to be a polyglucosan similar, if not identical, in structure to the β-amylose component of common cereal and tuber starches and to the starch polysaccharide previously isolated [E. S. R., 75, p. 149] from the woody tissue of the apple tree."

The higher saturated fatty acids of butter fat, G. E. HELZ and A. W. BOSWORTH (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 203–208*).—At the Ohio State University hexacosanoic (cerotic) acid has been isolated from butterfat.

"This acid crystallizes as nacreous crystalline plates from acetone and has a melting point of 80.5° [C.]. The methyl ester distills at 286° at 15±0.1 mm pressure and at 261° at 5±0.1 mm pressure. The melting point of the methyl ester is 62°. The amide melts at 105°–107°."

The action of acid and alkali on parathyroid hormone, W. R. TWEEDY, G. H. SMULLEN, and W. P. BELL (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 163–167, fig. 1*).—The authors found a parathyroid hormone preparation to contain 14.74 percent total nitrogen, with the following nitrogen distribution: Humin N 0.95 percent, dibasic N 21.13, acid amide N 4.39, and nonbasic N 71.53 percent.

"The close parallelism between the increase in free amino nitrogen and the accompanying diminution in hormone activity during gradual acid hydrolysis is additional evidence of the protein nature of parathyroid hormone. The action of 0.05 N NaOH on the parathyroid hormone preparation during a period of 5 hr. at 38° [C.] resulted in the liberation of NH_3 and a loss of approximately 67 percent in potency. It is suggested that the probable source of the NH_3-N was acid amide groups."

Comments on the microvolumetric sodium method of Ball and Sadusk, B. HOLMES and P. L. KIRK (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 377–380*).—The authors of this contribution from the University of California, having completed a study of a similar method at the time of the publication of the Ball and Sadusk procedure (E. S. R., 77, p. 9), offer suggestions permitting improvements in convenience and accuracy. For the reduction of the uranium compound from the hexavalent to the tetravalent state, they prefer to treat the solution of the precipitate in a small flask with saturated liquid cadmium amalgam rather than to use the Jones reductor. As titration oxidant they found ceric sulfate, with a phenanthroline-ferrous sulfate indicator, to give a sharper end point than that obtained in titrating with dichromate and a barium diphenylaminesulfonate indicator. The effect of temperature on the solubility of the triple acetate, said by Ball and Sadusk not to be of critical importance, is deemed capable of introducing serious error unless a temperature of not more than 20° C., "and preferably somewhat lower," is maintained during precipitation. A suitable filtration is considered safer than the use of the centrifuge as recommended by Ball and Sadusk.

A note concerning the determination of iodine, B. F. STIMMEL and D. R. MCCULLAGH (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 21–24, fig. 1; abs. in Chem. Abs., 31 (1937), No. 2, p. 424*).—The authors describe a modification of the alkali fusion method of McCullagh (E. S. R., 76, p. 150), with special reference to its use with fresh thyroid tissue and blood.

A gravimetric technique for the determination of small amounts of plasma lipids, H. R. STREET (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 25–31*).—The essential features of this method, contributed from the University of Minnesota, consist in the extraction of the fatty substances of the plasma with

3:1 alcohol-ether mixture, saponification of the fatty extractives with potassium hydroxide, acidification with dilute sulfuric acid, and extraction of the lipides from the acid suspension with petroleum spirit (b. p. 30° to 60° C., purified by washing with concentrated sulfuric acid and redistilling). The residue remaining after evaporation of the solvent under diminished pressure at from 58° to 62° is weighed as total lipides.

"If the values for cholesterol and fatty acids are desired, the lipides, after being weighed, are dissolved in chloroform, made up to volume in a volumetric flask, and aliquots are taken for the determination of cholesterol. . . . Fatty acids are calculated by subtracting the value for cholesterol from the value for total lipides."

An examination of the Sullivan colorimetric test for guanidine, M. X. Sullivan (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 233–235; abs. in Chem. Abs., 31 (1937), No. 3, p. 631*).—Noting the work of Braun and Rees (E. S. R., 77, p. 10), in which the Sullivan test for guanidine was found to be given also by related compounds (certain substituted guanidines), the author found that the five compounds in question "did in fact give a red color in the final step which would prevent determination of guanidine. However, the reaction was not a guanidine reaction, for no one of the compounds behaved like guanidine in the different steps and all of them could be readily made negative." By the use of hydroxylamine the test is made specific for guanidine in the presence of the derivatives found by Braun and Rees to interfere with the determination.

The chemical estimation of theelin with diazobenzenesulfonic acid, M. J. Schmulovitz and H. B. Wylie (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 415–421*).—A colorimetric procedure for the estimation of theelin is described in a contribution form the University of Maryland. The method is based on the coupling of theelin with *p*-diazobenzenesulfonic acid to give a red azo dye which is compared with a standard solution of β-naphthol coupled in the same manner. Certain observations concerning the stoichiometric nature of this reaction are recorded.

Evaporating the water with burning alcohol as a rapid means of determining moisture content of soils, G. J. Bouyoucos (*Soil Sci., 44 (1937), No. 5, pp. 377–383, pl. 1*).—In this contribution from the Michigan Experiment Station, the author proposes partial extraction with alcohol followed by drying with burning alcohol as a rapid and accurate method of determining the moisture content in soils.

The procedure consists of treating the soil with alcohol in a special apparatus and burning the alcohol, the heat from which evaporates the water and dries the soil completely. This alcohol-burning procedure raises the temperature of the soil to only about 130°–160° C. In mineral soils it has no influence on the combined water and no effect on organic matter up to about 11 percent, and is as accurate in determining moisture content as is the standard oven-drying method. In mucks, peats, and in mineral soils containing more than about 11 percent organic matter, especially in the undecomposed state, the method is not applicable.

"The method is rapid. It can determine the moisture content of sands in 5 to 10 min., loams in 10 to 20 min., and clays in 10 to 35 min., depending on their content of water and their permeability to alcohol."

A comparative study of methods of determining the moisture content of Cheddar cheese.—I, The modified Mojonnier and olive oil methods, I. A. Gould (*Jour. Dairy Sci., 20 (1937), No. 10, pp. 625–635*).—This study by the Michigan Experiment Station was conducted to determine the accuracy and practicability of a rapid, open-flame method for determining the moisture con-

tent of cheese in which a small amount of olive oil was added to the moisture dish to prevent burning and spattering of the cheese.

The use of 20 cc of olive oil with a 5-g sample of cheese proved more satisfactory than 10 cc of oil with either 5- or 2.5-g samples. However, from 30 to 40 percent of the cheese samples tested by the olive oil method spattered too badly upon heating to permit accurate moisture determinations, and, in addition, practically all samples lumped together and stuck to the bottom of the pan. The addition of about 1 g of sodium chloride to the oil eliminated the spattering, lumping, and sticking tendencies encountered by the above method.

Results obtained with the olive oil test on nonspattering samples averaged about 0.3 percent higher than by the modified Mojonnier method, while all samples averaged about 0.5 percent higher by the modified olive oil method than by the Mojonnier procedure. The action of the salt in this test was not merely physical, as indicated by the fact that substitution of dry sand for salt did not prevent sticking or spattering. This modified olive oil method is considered a simple and rapid test, sufficiently accurate for all practical purposes.

Which test gives the most accurate fat determination for ice cream? F. C. Button (*Jour. Milk Technol., 1 (1937), No. 1, pp. 30, 31*).—In a critical consideration of various tests which have been proposed for determining the butterfat content of ice cream, the author refers to a recent report of the Association of Official Agricultural Chemists stating that apparently none of the numerous modifications of the Babcock fat test is applicable to a determination of fat in ice cream in the hands of different operators. In this report it is recommended that a study of such modifications be discontinued. The author makes a plea for the adoption of some method or set of correction factors which shall be recognized as standard in order to end the confusion now existing on this particular point of dairy technology.

The determination of cystine in urine, M. X. Sullivan and W. C. Hess (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 221–232*).—"Because of the buffering power of urine, the presence of reducing material, and of substances combining with 1,2-naphthoquinone-4-sodium sulfonate, the original Sullivan cystine procedure [E. S. R., 70, p. 444], when applied to urine, must be modified by using an alkaline cyanide for reduction, with washing of the sediment occurring on addition of alkaline cyanide, and by the use of more naphthoquinone for full color development."

A discrepancy between biological assays and other methods of determining vitamin A, II, H. Pritchard, H. Wilkinson, J. R. Edisbury, and R. A. Morton (*Biochem. Jour., 31 (1937), No. 2, pp. 258–265, figs. 5*).—Continuing a previous study (E. S. R., 76, p. 4), a method of separation of the vitamin A concentrate from mammalian liver oil and commercial cod-liver oil into two fractions by exhaustive extraction with aqueous 83 percent alcohol is presented. The alcohol-soluble fractions exhibited the chemical and physical characteristics attributed to vitamin A, while the insoluble fractions generally failed to show even an inflection at 328 mμ, but exhibited a maximum at 285–290 mμ in the ultraviolet absorption spectrum and possessed much greater biological activity. The insoluble fraction from one mammalian liver oil concentrate contained no detectable vitamin A, but possessed a biological activity of 17,900 international units per gram.

Utilization of fruit in commercial production of fruit juices, M. A. Joslyn and G. L. Marsh (*California Sta. Circ. 344 (1937), pp. 63, figs. 15*).—Superseding Circular 313 (E. S. R., 59, p. 488), commercially practicable processes are discussed under the headings trends in fruit-juice production; general principles;

selection and preparation of the fruit; juice extraction; straining, filtration, and clarification; deaeration; metallic contamination; preservation processes; bottling or canning; canned pulpy fruit-juice beverages; canned orange dairy base; retention of vitamin C in fruit juices; carbonation of fruit juices; fruit-juice sirups; fruit-juice concentrates; yields; and plant sanitation and cleanliness. Under the further caption, "summary of processes," are given condensed outlines of treatments for individual fruits.

Drying Kieffer pears and the use of the dried product, C. W. CULPEPPER and H. H. MOON (*U. S. Dept. Agr. Circ. 450 (1937), pp. 24, figs. 5*).—"Kieffer pears ripened at 60° F. for a sufficient length of time to give a pressure test of 2.5 to 3.5 lb. with the Magness pressure tester made a dried product much superior to that made from unripened fruit. When properly dried to a moisture content of 10 to 15 percent the ripened product was pliable, pale yellow in color, somewhat translucent, and when cooked made a table product that was mild and pleasing in flavor. The unripened product was hard, less flexible, opaque gray or white in appearance, and when cooked was tough and lacking in flavor."

Working details of the process developed are fully stated, together with keeping qualities, other characteristics, and uses of the finished product.

AGRICULTURAL METEOROLOGY

Ten-day forecasting as developed by Franz Baur, G. T. WALKER (*Quart. Jour. Roy. Met. Soc. [London], 63 (1937), No. 272, pp. 471–475, pls. 4, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 40 (1937), No. 479, p. 1137*).—The Baur method of forecasting the "broad-weather" situation 5 to 10 days in advance is explained, and observations and successful forecasts by means of it are discussed.

Modernizing headwater forecasting, M. M. BERNARD (*Engin. News-Rec., 119 (1937), No. 25, pp. 972, 988–990, figs. 3*).—A plan for improving and extending the cooperative collection of rainfall data to furnish a better basis for flood forecasting and control is proposed. An editorial on flood forecasting is included.

Report of the committee on snow, 1935–36, J. E. CHURCH ET AL. (*Amer. Geophys. Union Trans., 17 (1936), pt. 2, pp. 265–286, fig. 1*).—Reports of progress during 1935–36 are given, with a considerable bibliography of the subject.

Interception of rainfall by herbaceous vegetation, O. R. CLARK (*Science, 86 (1937), No. 2243, pp. 591, 592*).—In field studies with prairie vegetation, crop plants, and weeds, it was found that "the amount of water held upon the surfaces of leaf and stem and prevented from reaching the soil is very great. . . . The amount of water thus held depends largely upon the rate at which the water falls and, to a certain extent, upon the environmental conditions, especially wind movement. In the plants studied, little water ran down the stems and thus reached the soil. So far as use to the vegetation is concerned, the water intercepted represents a loss, which over large areas becomes enormous."

Relation between crop yields and evaporation [trans. title], A. KUHNKE (*Schr. Königsb. Gelehrt. Gesell., Naturw. Kl., 13 (1936), No. 4, pp. [55]–158, figs. 34; abs. in Ann. Agron. [Paris], n. ser., 7 (1937), No. 6, p. 864; Jour. Landw., 85 (1937), No. 2, p. 160*).—Measurements of evaporation at different heights in fields of wheat, barley, and clover showed a significant relation between rainfall, wind, evaporation, and yields, especially in the period immediately following the rainfall.

Influence of climatic conditions on the evolution of ammoniacal nitrogen in fertilizers during winter [trans. title], J. SARAZIN (*Compt. Rend. Acad. Agr. France, 23 (1937), No. 30, pp. 943–946*).—It is shown that when the winter

is mild and humid there is a considerable loss of ammoniacal nitrogen from the manures applied in the fall, thus creating a need for supplementary application of nitrogen fertilizers in the spring.

Regional contrasts in erosion in Indiana, with especial attention to the climatic factor in causation, S. S. VISHER (*Bul. Geol. Soc. Amer., 48 (1937), No. 7, pp. 897–929, figs. 27*).—The study of soil erosion in Indiana here reported "leads to the deduction that aspects of the climate hitherto little studied have contributed not only to regional contrasts in soil erosion, but to regional contrasts in the development of features of larger physiographic significance."

"A climatic factor not previously investigated—namely, regional contrasts in rainfall intensity—clearly is also of great importance in causing the marked regional contrasts. Southern Indiana has from several to many times as many downpours of rainfall and consecutive days of heavy rain as does northern Indiana, and larger amounts of rainfall in its rainy spells. Intense rains yield much more run-off than do moderate rains, and as the transporting power of run-off increases approximately as does the cube of the velocity, erosion increases enormously in places where heavy rains occur frequently, provided the soil is not protected by adequate vegetative cover.

"Erosion greater in southern than in northern Indiana is, therefore, the result of a combination of influences, of which one of the more fundamental appears to be the differences in climate, which in turn are largely the results of relative location, for the differences in altitude are slight. *Southern Indiana, because of its lower latitude, receives more intense insolation, with which are associated higher temperatures, greater atmospheric convection, and, hence, greater intensity of rainfall.*"

Monthly Weather Review, [September–October 1937] (*U. S. Mo. Weather Rev., 65 (1937), Nos. 9, pp. 323–357, pls. 11, figs. 5; 10, pp. 359–383, pls. 9, figs. 6*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 9.—On Some Properties of the Water-Vapor Spectrum and Their Relations to Atmospheric Radiation, by W. M. Elsasser (pp. 323–326); On Pilot Balloons and Sources of Light for High Altitude Upper-Wind Observations, by W. H. Wenstrom (pp. 326–331); and Tropical Disturbances on the North Atlantic Ocean and Gulf of Mexico, September 1937, by W. E. Hurd (pp. 332–335).

No. 10.—Serial Numbers of Weather Bureau Publications, by H. Lyman (pp. 359–363); Preliminary Report on Observations of Air Cells in Snowflakes and in Other Forms of Ice, by C. M. Heck (p. 364); and Further Observations on the North American High-Level Anticyclone, by T. R. Reed (pp. 364–366).

SOILS—FERTILIZERS

[**Soil investigations of the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1937, pp. 19, 20, 23*).—Results are noted of work on the isolation from soils of allantoin and dicarboxylic glutaric acid, the use of soil inoculants, the isolation of *Bacillus cereus* in medical laboratories, and salinity in irrigated soils.

[**Bureau of Chemistry and Soils soil and fertilizer investigations**] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1937, pp. 34–42*).—Data are reported on catalysts in nitrogen and phosphate fertilizer production; physical constants of gases and fertilizer salts; biochemical and organic nitrogen investigations; nitrogenous fertilizer materials; phosphates; potash salts and byproducts; mixed fertilizer technology; selenium in soils; nonfertile, poorly drained, allu-

vial, granitic, and limestone soils; moisture in soils; adsorption of gases by soils; and structure of peat.

[Soil investigations at the Colorado Station] (*Colorado Sta. Rpt. 1937, pp. 15, 16, 44, 45*).—The station here reports work on nitrogen deficiency in the soil as a cause of wheat chlorosis, control of excessive soil nitrates, microbiological tests for available phosphorus, microbiological activities of slick-spot soils, and decomposition of organic matter.

Studies in electrodialysis of soils.—II, Polarigraphic current-voltage curves, A. N. Puri and R. C. Hoon (*Soil Sci., 44 (1937), No. 5, pp. 399–408, figs. 10*).—Continuing a series opened with a contribution on rotating electrodes (E. S. R., 77, p. 449), the authors now describe a simplified apparatus for the measurement of current-voltage relations in soils by means of which they have shown that "polarigraphic current-voltage curves for soils having different exchangeable bases bear a close resemblance to such curves for soluble salts of corresponding bases. It appears, therefore, that exchangeable bases in soils exist in chemical combination and not in the absorbed state."

A preliminary study of the effect of cultivation on certain chemical and physical properties of some South Dakota soils, L. F. Puhr and O. Olson (*South Dakota Sta. Bul. 314 (1937), pp. 31, figs. 8*).—"Structural stability of aggregates . . . was found to be the same in virgin and in cultivated soils, but cultivated soils showed a tendency toward more rapid slaking in water than did virgin soils.

"Losses in humus and loss on ignition occurred in the cultivated soils in every case. . . . An average loss of 42 percent of the original organic matter resulted from cultivation in the soils which were studied. With such large losses of organic matter changes in structure would be anticipated. Since marked changes in structure were not found, it appears that while organic matter may be necessary in the development and maintenance of favorable structure, its value diminishes after the soil has acquired sufficient organic matter for the development of maximal structure. In the virgin soils, the larger amounts of organic matter were probably responsible for the increased time of slaking.

"The mechanical analyses showed that little change in the texture of the soils has been brought about by cultivation. In three clay soils studied, a slight increase in the $\frac{\text{sand}+\text{silt}}{\text{clay}}$ ratio resulted. All other soils showing slight decreases in the $\frac{\text{sand}+\text{silt}}{\text{clay}}$ ratios of the cultivated soils.

"Cultivation resulted in a decrease in base exchange capacity in all soils studied with the exception of two. Since these two represent relatively small increases as compared with the decreases, it may be that original differences in the soil were responsible for the apparent discrepancy. Decreases in base exchange capacity were found to correspond closely with decreases in organic matter.

"Losses in nitrogen were found in all cases. The average loss for the eight cultivated soils was found to be 29 percent of the original nitrogen content. The $\frac{\text{organic matter}}{\text{nitrogen}}$ ratio was found to be decreased by cultivation, indicating a higher concentration of nitrogen in the organic matter of cultivated soils.

"The phosphorus content of three soils was increased through cultivation. Decreases resulted in all other cultivated soils studied. In general, the eastern South Dakota soils decreased in phosphorus content as the result of cultivation.

"The pH of western South Dakota soils was increased, while that of eastern South Dakota soils was decreased, as the result of cultivation."

Base exchange in soils, A. T. PERKINS and H. H. KING (*Kans. Acad. Sci. Trans., 38 (1935), pp. 163–170*).—With reference to soil particles coarser than 4μ, the authors of this contribution from the Kansas Experiment Station conclude that in the coarser soil particles adsorbed base does not affect the size of particle as separated by sedimentation and according to specific gravity.

"When dealing with the coarser soil particles, as the degree of fineness increases the percentage of SiO_2 decreases and the percentage of R_2O_3 bases increases. Therefore, the $R_2O_3:SiO_2$ ratio decreases with increased fineness. The base-exchange capacity for these particles varies inversely as the $R_2O_3:SiO_2$ ratio. The finer soil particles have a greater base-exchange capacity per gram than the coarser particles. The finer soil particles have a lesser base-exchange capacity per surface area than the coarser particles. In general our data show that the base-exchange capacity of a soil is largely associated with the higher minerals." Some of the data indicate the presence of a heavy mineral active in base exchange, however.

New light on alkali soils, W. T. MCGEORGE and J. F. BREAZEALE (*Calif. Citrogr., 21 (1936), No. 7, pp. 246, 247*).—In a brief semipopular article contributed from the Arizona Experiment Station, the authors present the view that "few alkali soils contain sufficient alkali to be poisonous toward the plant. Their infertility is due to the fact that in the presence of an alkaline reaction and, therefore, the absence of carbonic acid plants die of starvation because they cannot absorb nitrate or phosphate from an alkaline medium."

Slick spots in western Colorado soils, R. GARDNER, R. S. WHITNEY, and A. KEZER (*Colorado Sta. Tech. Bul. 20 (1937), pp. 13, fig. 1*).—The typical "slick spots" of the area included in this investigation were found to contain sodium in the exchange complex to a high percentage of saturation, together with large quantities of calcium sulfate and a relatively high concentration of sodium salts. "There is sufficient swelling of the colloids to reduce the pore space of the soil and greatly restrict water movement in spite of the fact that they are coagulated by the high salt concentration.

"If these conclusions are correct, it will be necessary to remove the sodium salts by drainage before any great improvement in the soil can be expected. The addition of calcium sulfate is of doubtful value where there is already so much present. Adding calcium chloride or other soluble calcium salt would only add to the calcium sulfate by reacting with the sodium sulfate present. However, as soon as the sodium salts are removed, improvement should be expected by reaction of the calcium from the calcium sulfate with the sodium clay to produce calcium clay. The presence of calcium sulfate should prevent the occurrence of extremely high pH due to hydrolysis of sodium clay. These conclusions apply to the average slick spot and not necessarily to all the slick spots."

Physicochemical reactions between organic and inorganic soil colloids as related to aggregate formation, H. E. MYERS (*Soil Sci., 44 (1937), No. 5, pp. 331–359, pl. 1, figs. 5*).—The author found, in an investigation reported from the Missouri Experiment Station, that organic colloidal sols altered the viscosity of colloidal clay sols to such an extent that the change could not be explained on the basis of mechanical mixing. The extent of the alteration in viscosity was influenced by the quantity of organic colloid added, the cation present, and the type of soil colloid used. The mixing of organic colloids with soil colloids or with finely divided quartz, orthoclase, or aluminum oxide resulted in a reduction in the exchange capacity of the systems from the calculated values. The cataphoretic velocities of colloidal clay soils were altered by the presence of organic colloids in the system. With increasing quantities of organic colloid, the migra-

tion velocity increased to a maximum value and then decreased. There appeared to be a chemical union between the organic and the inorganic colloids. In general, the tendency to combine appeared to be most marked under acid conditions. Polar adsorption was suggested as the most probable type of chemical reaction involved. Desiccation, when followed by thorough rewetting, had very little influence on the exchange capacity of the organic colloids studied. Desiccated calcium organic colloid was more highly reversible in water than was desiccated hydrogen organic colloid.

Organic colloids, when saturated with either calcium or hydrogen ions, were several times more effective in cementing sand particles into water-stable aggregates than were the corresponding inorganic colloid systems. Stable-aggregate formation apparently does not take place in the absence of dehydration. The favorable effect of organic matter on stable aggregation was probably associated with the low degree of dispersion of the organic matter after dehydration.

Cellulose decomposition in synthetic and natural soils, M. R. MADHOK (*Soil Sci., 44 (1937), No. 5, pp. 385–397, pl. 1*).—At the New Jersey Experiment Stations a synthetic medium containing sand and bentonite has been found to be suitable for the study of the various factors affecting the decomposition of cellulose by micro-organisms. Sodium nitrate was a better source of nitrogen than was ammonium sulfate, and a slightly acid initial reaction was most favorable for the decomposition process. Fungi were very prominent initially but were later replaced by bacteria.

A qualitative and quantitative study of the micro-organisms developing at different reactions with the two sources of nitrogen indicated that the fungi were more prominent at an acid reaction, whereas bacteria were more active at neutral or slightly alkaline reactions. The total number of bacteria after 30 days was much higher in the presence of sodium nitrate than in the presence of ammonium sulfate. The decomposition started more quickly at 37° C., but later the rate of decomposition at 27° and 20° approached that at 37°.

Great differences in fertilizer treatments applied during a period of 25 yr. exerted no appreciable effect on the micro-organisms decomposing cellulose.

[Soil investigations in bacteriology at the New York State Station] (*New York State Sta. Rpt. 1937, pp. 17, 18*).—This report deals very briefly with responses (as indicators of nutrient deficiencies) of certain soil bacteria inoculated into sterile samples of the soil to be tested, and the detection of *Bacterium radiobacter* as a contaminant of cultures of legume nodule bacteria.

Influence of light and heat upon the formation of nitrate in soil, S. A. WAKSMAN and M. R. MADHOK (*Soil Sci., 44 (1937), No. 5, pp. 361–375, fig. 1*).—The investigation here reported from the New Jersey Experiment Stations comprised two series of experiments, of which the one was directed to the purpose of evaluating the relative effectiveness of sunlight and of micro-organisms in soil-nitrate production, whereas the other was concerned with the effect of heat and drying as nitrate-producing agencies.

Of the results of the first group of experiments it is reported that "when a sandy soil was used in an air-dry condition, no nitrification took place, even when the soil was exposed to full sunlight for a period of 470 hr. In a loam soil, no nitrification of the soil's own nitrogen or of added organic nitrogen occurred, but ammonium sulfate added to the soil was actively oxidized. A slight difference in favor of the soil exposed to sunlight cannot be considered of sufficient significance to be ascribed to the effect of photonitrification. When the soils were kept in a moist state, either in pots or in large glass dishes, no significant difference could be detected in the rate of nitrification of different

forms of nitrogen between the covered and the exposed soils, either in the light sandy soil or in the heavy loam soil. A temperature of 27°–37° C. was found to be most favorable for the activities of the nitrifying bacteria. Above and below that range of temperatures, the rate of nitrification was reduced."

In the second group of experiments, "drying of leached soil at 50° and 65°, followed by leaching, yielded small amounts of nitrate. Added sources of nitrogen in the form of ammonium salt and organic substances did not result in any increase in the amount of nitrate obtained by drying the soils. Nitrate added to the soil was not recovered in the first leaching, but small amounts were obtained after several dryings and leachings. As a result of biological oxidation of ammonia, the nitrate was not removed completely from the moist soil. On drying the soil and extracting with water more nitrate was obtained. The water used for leaching the soil and the reagents employed in the determination gave almost as much nitrate as the soil, after the first few leachings. In a soil with little biological nitrification, the nitrate found after the first leaching was always about the same as that found in the control. . . .

"The final conclusion from these two groups of studies on the formation of nitrate in soil is that the biological oxidation of ammonia to nitrite and of nitrite to nitrate must still be considered as the all-important process in the formation of nitrate in soil."

Methods for inspection of commercial legume inoculants, A. W. Hofer (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 655–671*).—A review of new methods for legume inoculant inspection, carried out at the New York State Experiment Station, suggests several possibilities for improvement.

"The most important consists of a change from the present plan of examination for nodules to one that will measure the benefit which the individual cultures confer upon their hosts. At the present time the tests do not accomplish all that they might. They are still in a period of development. Improvement of inspection by use of a simple greenhouse efficiency test that correlates fairly well with field results is much to be desired. The actual realization of a workable plan for bringing the tests into close harmony with fundamental science and practical agriculture would have real value. It would, in fact, represent the end of the period of development in legume inoculant inspection and the beginning of a new period of practical utility based upon modern scientific knowledge."

Some ideas of soil deficiencies, R. M. Barnette (*Citrus Indus., 17 (1936), No. 2, pp. 3, 19, 22*).—The author of a semipopular article from the Florida Experiment Station discusses such possible causes of deficiency as fixation of phosphates by iron and aluminum compounds in the soil, potassium deficiency in sandy soils of low organic matter content brought abont by overliming, precipitation of needed zinc compounds by added phosphates, iron deficiencies induced by overliming, etc. The possible value of fallowing and of rotation in soil management is also taken up.

Rapid chemical tests for Coastal Plain soils, J. B. Hester, J. M. Blume, and F. A. Shelton (*Virginia Truck Sta. Bul. 95 (1937), pp. 1429–1487, figs. 14*).—Phosphates of different degrees of solubility were used in sand cultures to establish the relation between plant absorption and solubility in water and in a sodium acetate solution (pH 5.0) very similar to that developed by Morgan at the Connecticut [New Haven] Experiment Station (E. S. R., 73, p. 746). A good correlation was found to exist between the solubility of different phosphates (iron, aluminum, manganese, magnesium, and calcium) and plant growth. These correlations were further established in soil cultures and finally on field plats with various fertilizer practices.

"Investigations of the availability of replaceable potash have established a practical system of fertilization for predominant Coastal Plain soils for certain crops. A system of potash fertilization is established for certain soils on the basis of anticipated yields and available potash present."

Rapid chemical methods for testing soils to determine degree of fertility in respect to nitrogen, manganese, magnesium, aluminum, and chlorides are given. The accuracy of these tests is discussed "and the reproductivity of the results in the hands of various chemists shown."

Demonstration of quickly made chemical tests for fertilizer elements in soils, H. G. M. JACOBSON (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 274, 275*).—This note, contributed from the Connecticut [New Haven] Experiment Station, is a very brief outline of the Morgan test developed at the station (E. S. R., 73, p. 746).

Interpreting rapid chemical soil tests for phosphorus for vegetable crops, J. B. HESTER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 584–588, fig. 1*).—The author compared the indications of a rapid test for available phosphate with the phosphate fertilizer responses of various crops in the field and in pots at the Virginia Truck Experiment Station. The agreement was in general satisfactory, but "while short chemical tests are a great help in recommending soil amendment, too much must not be expected from them, especially until sufficient data have been collected for their interpretation."

[Soil investigations], A. T. WIANCKO, R. R. MULVEY, and S. R. MILES (*Indiana Sta., Soils and Crops Expt. Farm Rpt., 1915–36, pp. 7–9*).—This report summarizes a general fertility experiment and a comparison of various phosphates.

[Indiana soil experiment field studies, 1919–36], A. T. WIANCKO ET AL. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–36, pp. 1–3; Huntington Field, 1919–36, pp. 1–3; Jennings Co. Field, 1921–36; pp. 1–5, fig. 1; Pinney-Purdue Field, 1920–36, pp. 1–5, 7, 8; Sand Field, 1924–36, pp. 1–5*).—Each of these reports contains a brief indication of desirable management practice under the heading how to treat this kind of land and a summary of the results to 1936 of the general fertility test with various fertilizers and lime (E. S. R., 74, p. 161).

The use of fertilizer on Florida soils, R. W. RUPRECHT (*Citrus Indus., 17 (1936), No. 3, pp. 9, 17*).—This is a discussion from the Florida Experiment Station of the special needs of the sand soils, of little clay or humus content, largely used for truck and other crops in Florida. "For most crops from 1,500 to 3,000 lb. per acre of a fairly high grade fertilizer are used," and irrigation is also needed for some of these sands.

How to combat acidity in the soil, R. W. RUPRECHT (*Citrus Indus., 17 (1936), No. 2, pp. 6, 18*).—This is largely a nontechnical discussion of the value and use of liming materials. Emphasis is placed upon the need for determining the actual lime requirements of the soil, if any, before making any application.

The relation of potassium, calcium, and sodium to magnesium deficiency, R. L. CAROLUS (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 595–599*).—According to the author, reporting from the Virginia Truck Experiment Station, "from the standpoint of magnesium nutrition the work suggested that relatively large amounts of Na salts should not be used in combination with Mg salts for the correction of magnesium deficiency. The plant content of any single cation may be as largely influenced by the application of some other cation to the soil as by the addition of the one determined in the analysis. The results of this work indicate the extreme necessity for a fairly well balanced fer-

tilizer. To determine the approximate balance in the cation content of a fertilizer that would produce maximum plant development, varying proportions of many combinations of the four ions would probably have to be tested in soils with different levels of fertility for each crop under consideration."

Commercial fertilizers report for 1937 (*Connecticut [New Haven] Sta. Bul. 404 (1937), pp. 59+IX*).—In addition to the usual analyses of fertilizer mixtures and fertilizer materials (E. S. R., 76, p. 599), this bulletin presents an analysis of a vegetable waste sold by itinerant vendors as "top dressing." "The 742 lb. of organic matter [per ton] has agricultural value as a mulch and as a conditioner for sandy soils to increase their water-holding capacity. . . . As a fertilizer, the value of such waste products as we have examined is negligible, but for the purpose herein cited they have some value."

A discussion of acid-base balance in mixed fertilizers, by M. F. Morgan, is included.

AGRICULTURAL BOTANY

Plants useful to man, W. W. Robbins and F. Ramaley (*Philadelphia: P. Blakiston's Son & Co., [1937], 2. ed., pp. IX+422, figs. 235*).—In this second edition of the work previously noted (E. S. R., 70, p. 25), the general plan and the emphasis on the historical, ecological, and physiological aspects remain the same. The chapter on sources of cultivated plants has been rearranged to bring out the original native homes of plants and to emphasize the early centers of agriculture, and new material has been added to, or modifications made in, the accounts of alfalfa, flax, figs, potato, and various ornamental plants.

Southern Appalachian grass balds, B. W. Wells (*Jour. Elisha Mitchell Sci. Soc., 53 (1937), No. 1, pp. 1–26, pls. 5, figs. 2*).—In this further contribution (E. S. R., 76, p. 12) by the North Carolina State College, 23 local grass or sedge-covered areas ("grass balds") in the high southern Appalachians are described, and the theory is advanced (with presentation of evidence) that they could have originated only through human activity—presumably that of the Cherokee Indians. The plant distribution is presented on a 1–5 scale of dominance with an initial list of 125 species, among which mountain oatgrass (*Danthonia compressa*) is the most important. On many of the high ridge trails long sections have developed the bald plant association, showing that the grass community may appear only after a long and severe disturbance of the original vegetation at the soil level. A grass bald is in a sense only an expanded trail. After abandonment of these disturbed areas, a ruderal or weed stage ensues, followed by the permanent grass or sedge community. During drought summers much of the grass may be killed, and a new subsere may be initiated by the ruderal plants. The high mountain grass and sedge are able to compete successfully with the woody vegetation without the aid of fire, thus accounting for the maintenance of these artificial areas through centuries of time.

A preserve unhampered by man, F. C. Gates (*Kans. Acad. Sci. Trans., 39 (1936), pp. 89–93, figs. 11*).—This contribution by Kansas State College presents brief ecological notes on a fenced-in, undisturbed area surrounding an artificial pond left by a paving company in 1923 as showing "how well nature itself can make a beauty spot if unhampered by man."

An analysis of the flowering plants of Nebraska, with keys to the families, genera, and species, and with notes concerning their occurrence, range, and frequency within the State, J. M. Winter (*Thesis, Univ. Nebr., Lincoln, 1936, pp. III+203*).—A detailed analysis is given.

Oklahoma flora, T. R. Stemen and W. S. Myers (*Oklahoma City: Harlow Pub. Corp., 1937, pp. XXIX+706, figs. 494*).—This manual contains 147 families,

640 genera, and 1,626 species, but excludes the grasses, sedges, and rushes. A general analytical key to the families is provided, as well as keys to lesser groups interspersed through the work. Appendixes list wild flowers that should be protected, hay fever plants, poisonous plants, drug plants, native shore and water plants useful as food or shelter for wildlife, and the edible plants of the State. Indexes of scientific and English names of plants and a glossary are provided.

The flora of Puerto Rico, I–III, A. Stahl (*Flora de Puerto Rico. San Juan: Fed. Emergency Relief Admin., 1936, 2. ed., vols. 1, pp. 343, pl. 1; 2, pp. 165; 1937, 2. ed., vol. 3, pp. 373*).—Following an introductory sketch of the life and work of the author (by C. E. Chardon) and a section on the literature, the first of this 3-volume series on the flora of Puerto Rico takes up the 13 orders of the Talamipetalae from the Policarpinae to the Sarmentaceae, with their subdivisions, and the 3 tribes of the Leguminosae (Papilionaceae, Caesalpineae, and Mimoseae). The second covers the Tricoccae through the Lorantheae, with a key to the 11 major groups included. The concluding volume covers the Rubiaceae through the Gesneriaceae, with keys to tribes and genera.

Catalogue of the flora of the State of Texas, V. L. Cory and H. B. Parks (*Texas Sta. Bul. 550 (1937), pp. 130, fig. 1*).—This bulletin lists all plants from ferns to composites, inclusive, known to occur and reproduce spontaneously within the State, whether native or introduced. A list of the 162 families included precedes the 1,063 genera and 5,099 species and varieties given in the flora (with intra-State distribution) by families. An index to both families and genera is provided.

Valuable plants native to Texas, H. B. Parks (*Texas Sta. Bul. 551 (1937), pp. 173, fig. 1*).—The data presented are based on records made by the author at the Apicultural Research Laboratory near San Antonio, covering many years and a total of over 3,000 plants, those being included which have abundant possibilities for use as ornamentals, for erosion control, etc. Only plants actually observed or studied experimentally have been included, and much work has been done in hunting out and testing those species thought to be valuable to man in any way and at the same time supplying food for bees. The technical names used are the same as those presented in Bulletin 550 of this station (see above), and the common names are mostly those used in Standardized Plant Names (E. S. R., 53, p. 122). The species are arranged by families from the ferns through the composites, and for each a brief description is given, with its intra-State distribution and various facts concerning its ecological relations, uses, and the sources from which it may be obtained, where known. An index to genera and species is provided.

Recent additions to the Gray Herbarium from southeastern Virginia: A review, G. M. Shear (*Claytonia, 3 (1937), No. 4, pp. 51–53*).—This is a contribution by the Virginia Polytechnic Institute.

Seaside shrubs: Wind forms vs. spray forms, B. W. Wells and I. V. Shunk (*Science, 85 (1937), No. 2212, p. 499*).—This is a contribution by the North Carolina State College.

Polynesian botanical bibliography, 1773–1935, E. D. Merrill (*Bernice P. Bishop Mus. Bul. 144 (1937), pp. 194*).—The basis of this work is the author's "Bibliography of Polynesian Botany,"[1] with additions from various sources.

[Botanical work by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus., Rpt., 1937, pp. 22, 23*).—Brief summaries are given of studies of the relation of molybdenum to nitrogen metabolism (using *Aspergillus niger* as test organism), and sand-culture equipment and plant nutrition.

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[1] Bernice P. Bishop Mus. Bul. 13 (1924), pp. 68.

Electrochemical methods in the study of plant cells, W. J. V. Osterhout (*Electrochem. Soc. Trans., 71 (1937), pp. 93–101, figs. 4*).—"By means of electrochemical methods we can study vital processes with minimal disturbance of the organism. The surface of the protoplasm consists of a thin layer of low dielectric constant which regulates metabolism and determines electrical behavior. Its electric capacitance and resistance have been measured. Its diffusion potentials are discussed. It can be greatly altered without killing the cell. Models have been made to imitate its behavior."

The measurement and regulation of pH with the glass electrode, D. A. MacInnes and L. G. Longsworth (*Electrochem. Soc. Trans., 71 (1937), pp. 73–88, figs. 8*).—"The history of the glass electrode is briefly outlined, after which the construction of the more modern types of the electrode is discussed, together with the methods for potential measurement. An account is made of the comparison of the glass and the standard hydrogen electrode. An apparatus for accurate routine pH measurements with the glass electrode is described, also an apparatus used for maintaining the pH constant during bacterial growth."

A paraffin block trimmer, G. E. Cauthen (*Science, 86 (1937), No. 2228, p. 248, fig. 1*).—This is a contribution by the Kansas Experiment Station.

"Air conditioning" for microtomes, R. T. Hance (*Science, 86 (1937), No. 2231, pp. 313, 314*).—This describes an easily constructed means of utilizing the cooling power of dry ice (solid CO_2) to keep the paraffin block, knife, and microtome cool in warm weather. It costs practically nothing.

Equipment for growing plants in nitrogen fixation studies, C. A. Ludwig (*Bot. Gaz., 98 (1937), No. 4, pp. 670–679, figs. 3*).—One of the two types of equipment described consists of a shallow water bath, an overhead bank of lights, and the accessory equipment for operation. The main points of difference from previous installations lie in discarding light filters and air-conditioning devices for control of spectral balance and air temperatures, and in substituting mercury vapor lamps and a water bath. Most plants grew well at the highest air temperatures reached if the spectral balance was fairly good and the roots did not become too warm. The intensity of illumination secured was usually about 1,500–2,200 footcandles, and with 1,000-w lamps over 4,000 footcandles have been attained.

The second apparatus consists of a unit composed of a water-jacketed glass-culture chamber mounted by a rubber stopper in a wide-mouthed Erlenmeyer flask containing the material in which the roots are to grow. To conserve light, a number of such units are assembled in a tin plate housing. Good growth of small-leaved plants under biologically controlled conditions proved easy to secure with this equipment.

Influence of drying upon soil used as a medium for bacteria, H. J. Conn and M. Darrow (*Jour. Bact., 34 (1937), No. 3, p. 347*).—An abstract of a paper contributed by the New York State Experiment Station.

Isolating single spores without special equipment, J. R. Kienholz (*Phytopathology, 27 (1937), No. 9, pp. 950, 951, fig. 1*).—A method for isolating single spores, which can conveniently be seen under the low-power microscope objective, is described and illustrated.

Methods of growing plants in solution and sand cultures, J. W. Shive and W. R. Robbins (*New Jersey Stas. Bul. 636 (1937), pp. 24, figs. 8*).—"The purpose of this bulletin is to present very briefly some of the essential details of the methods of growing plants in solution culture and in sand culture. These methods have been in use for a number of years, and experience with them has demonstrated not only the possibility of producing in artificial media plants

equal in every respect to plants of like species grown under the usual conditions, but also the value of the method as a means of investigating important problems relating to the nutrition of the plants."

A comparison of nutrient salt solutions for the cultivation of excised tomato roots, P. R. White (*Growth, 1 (1937), No. 3, pp. 182–188, fig. 1*).—"The relative efficiencies of 17 salt solutions as nutrients for isolated tomato roots were tested. The standard solution previously used . . . gave the most satisfactory results, with Shive solution second. All satisfactory solutions had reactions below pH 6.0, all unsatisfactory ones had reactions above pH 6.0. Beijerinck and Tyrode solutions were greatly improved by acidification. An acid reaction thus appears to be necessary for satisfactory growth of isolated tomato roots."

The growth of pineapple plants in complete water cultures with either ammonia or nitrate salts, C. P. Sideris and B. H. Krauss (*Growth, 1 (1937), No. 3, pp. 204–210, figs. 3*).—Through this study by the Hawaiian Pineapple Producers' Experiment Station it was found that "the growth of pineapple plants in water culture with either ammonium or nitrate as the source of nitrogen in a complete nutrient solution follows the curve of an autocatalytic monomolecular reaction. The divergence between observed and calculated weight values of the first three periods are great on account of the readjustment of the plants to their environment. The weight values of the plants of the ammonium series were approximately of the same magnitude as those of the nitrate series, indicating that both forms of nitrogen were equally effective in promoting plant growth when the pH was maintained at pH 5.0 ± 0.4."

A separation of certain types of response of plants to photoperiod, A. E. Murneek (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 507–509, fig. 1*).—Studies on *Rudbeckia*, here reported by the Missouri Experiment Station, indicate that the influences of length of day on stem elongation and on reproduction are distinctly separable, though being affected by the same causal external factor. Hence, it is possible, as in the experiment detailed, to produce tall and rosette types of plants, both forming flowers in a normal manner. It is proposed to designate the curtailment of stem elongation by a photoperiod as "photoperiodic inhibition." A feature considered of considerable significance was the production of "vegetative flowers" under certain combinations of light exposure. The formation of partially developed flowers points to the fact that a certain "dosage" or number of days is necessary to induce fully the initiation and growth of reproductive organs. This would seem to suggest that possibly a certain substance or substances are produced gradually, the accumulation of which results eventually in the development of these organs. In tests with soybeans, photoperiodic inhibition was also found to be clearly separable from the effects of photoperiod on sexual reproduction.

The influence of light on the inflow of nutrient substances in plants, T. T. Demidenko and V. P. Golle (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 15 (1937), No. 6–7, pp. 375–380*).—Long-day plants (spring wheat, oats, and mustard), transferred to short-day conditions (8 and 12 hr.), formed massive vegetative growth. Short-day plants (corn, millet, buckwheat, and soybean) reacted to changes in light duration by corresponding alterations in the duration of the vegetative period. The crop yield increased in direct proportion to the length of day.

The discharge of nutrients by short-day plants increased with the length of the daylight period, which is taken to indicate the direct dependence on photosynthesis of the inflow of nutrients into the plant. Conclusions could not be drawn on the long-day plants in this respect, since under short days they failed to reach maturity.

Observations on the oxygen uptake of isolated plant tissue, I, II, J. CALDWELL and J. MEIKLEJOHN (*Ann. Bot. [London], n. ser., 1 (1937), No. 3, pp. 477–498, figs. 4*).—The following two papers are included:

I. *The effect of phosphate and of added carbohydrate*.—Using thin slices of tomato stem tissue, the highest values for oxygen uptake were found in the presence of M/30 potassium dihydrogen phosphate, measurements in distilled water giving slightly lower and stronger solutions of phosphate producing markedly depressed values. Tissue from very young plants (fifth leaf stage) showed a lower level of oxygen uptake than from slightly older plants (up to twelfth leaf stage), and a low level was also observed in tissues from old plants that had flowered. "It is concluded that the oxygen uptake is limited in old plants by the activity of the respiratory enzyme system and in very young plants by the amount of available respiratory substrate."

II. *The effect of inhibitors*.—Certain known inhibitors of enzyme activity, added to slices of tomato stem tissue, showed an inhibitory effect which increased with concentration, and concentrations below those inhibiting oxygen uptake had no stimulating effect. Cyanide (M/300) induced a reversible inhibition of about 85 percent of the total oxygen uptake, and no greater inhibition was produced by M/30 than by M/300. Sodium fluoride and iodoacetic acid had an irreversible inhibitory effect and sodium azide a reversible effect stronger in acid than in alkaline solution. Malachite green was effective in very small doses, the urethanes only in high doses. Amyl alcohol was ineffective at 1/3,000, but induced almost complete inhibition at 1/30.

Phytohormones, F. W. WENT and K. V. THIMANN (*New York: Macmillan Co., 1937, pp. XI+294, figs. 62*).—This monograph, dealing only with the hormones of the higher plants, outlines the development of the hormone concept, describes the technic of auxin determinations, and discusses the formation and occurrence of auxins, their relations to growth, their transport and polarity, the chemistry of auxins, the mechanism of their action, the growth of roots, tropisms, root formation, bud inhibition, and miscellaneous activities of auxins. A final chapter is concerned with general conclusions and the outlook for the future.

The growth of plant embryos in vitro: Preliminary experiments on the role of accessory substances, J. DONNER and G. AXTMAN (*Natl. Acad. Sci. Proc., 23 (1937), No. 8, pp. 453–457*).—Using embryos, with cotyledons removed, from sterilized pea seeds of the Perfection variety grown for 4 weeks in a synthetic inorganic salt agar medium containing 4 percent sucrose in Pyrex glass flasks, the effect of adding several accessory growth substances was studied. It was found that stem and root growth, particularly the latter, was markedly increased by crystalline vitamin B_1, vitamin C, and folliculin. Pantothenic acid increased the stem growth about as much as these but gave only slight increase in root growth. All these substances are natural plant products.

Salt accumulation and polar transport of plant hormones, F. W. WENT (*Science, 86 (1937), No. 2223, pp. 127, 128, fig. 1*).—The author gives theoretical and experimental confirmation to the homology between the concentration of ions from outside to inside of a cell and that of auxins from apex to base of a cell. The curve of transport of indoleacetic acid from base to apex (inverse transport) of the oat coleoptile proved to be exactly like the normal transport from apex to base, except that the applied concentrations must be 100 times as high to give numerically the same transport. This means that the polar auxin transport mechanism handles a constant amount of indoleacetic acid independently of the existing gradient, which is in direct parallelism with ion accumulation and with what is known regarding the effect of auxin on root formation.

The titration curves of 3-indole acetic, 3-indole propionic, and 3-indole butyric acids, H. G. ALBAUM and S. KAISER (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 420–422, figs. 3*).—The titration curves of these three synthetic auxins were determined for distilled-water solutions of various concentrations. Within the limits of molarities of 0.0004–0.01 M, the pK value bore a direct relation to the logarithm of the dilution. Differences in the titration curves of these growth substances proved too small to account for their differences in physiological activity.

Influence of indole acetic, indole butyric, and naphthalene acetic acids on roots of Lupinus albus seedlings, D. I. MACHT and M. L. GRUMBEIN (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 457–460*).—Growth of roots of *L. albus* seedlings was definitely stimulated after a brief (15 min.) exposure to a weak solution (*1 part to 5 billion*) *of indoleacetic, indolebutyric, and naphthaleneacetic acids.* On the contrary, longer exposures to the same concentration or exposures for a brief period to stronger concentrations produced a toxic or inhibitory effect on root growth.

Anatomical study of root production on application of indolebutyric acid to Cissus aerial roots, N. E. PFEIFFER (*Contrib. Boyce Thompson Inst., 8 (1937), No. 6, pp. 493–506, figs. 6*).—When aerial simple roots of *C. sicyoides jacquini* were treated with α-naphthaleneacetic, indoleacetic, indolepropionic, and indolebutyric acids in lanolin at 0.1–10 mg per gram of lanolin, the results were similar. The effects of the last are described, as applied either to the tips of intact roots, to definite zones back of the tip, or to small lightly scraped areas in the growing region 1.5 or 3 cm back of the tip. The first result noted was an increase in amount of cytoplasm and in size of living cells in the phloem and in the pericycle adjacent to the xylem. Simultaneous increase in water content in these tissues was great, often leading to conspicuous vacuoles. Periclinal divisions in the pericycle increased the number of cell layers over the xylem, and later divisions, both periclinal and anticlinal, produced small tissue masses over the protoxylem points—these constituting the lateral root primordia. Increases in size of nuclei and cells and their division occurred also in other tissues, and nuclear and cell divisions were normal with the low concentrations used. Along with these changes the main root diameter increased, while elongation was retarded. On striking a substratum, the main root produced lateral branches. In main roots treated with the synthetic growth substances, primordia were initiated and differentiated in the same manner. Abnormalities (e. g., production of vertical extensions of tissue with several root vascular cylinders) sometimes resulted from a second application.

Histological reactions of bean plants to growth promoting substances, K. C. HAMNER and E. J. KRAUS (*Bot. Gaz., 98 (1937), No. 4, pp. 735–807, figs. 53*).—In continuance of studies previously noted (E. S. R., 77, p. 29), it was found that apical tumors induced by application of 3 percent indoleacetic acid-lanolin to cut surfaces of decapitated bean plants may continue development for over 6 mo. and attain diameters of 2 cm or more. Large, irregular vascular tumors developed when similar mixtures were applied as a narrow band around an uninjured young internode of the stem, response being about equal above and below the band under average greenhouse conditions. Apical tumors were also induced by application of 1.5 percent indolebutyric acid-lanolin, by 0.5 percent naphthaleneacetic acid-lanolin, and by 1.5 percent mixtures of each of the substances. The developmental and histological characters of all these tumors are described and illustrated in detail, those induced by the 1.5 percent mixtures showing greater differences than tumors induced by application of weaker or stronger concentrations of the same substance. Application of 3

percent indoleacetic mixture to the cut surfaces of partially mature pods (tips removed) resulted in very large vascular apical tumors and roots.

"The quantitative response made by stems or pods when treated with any one of the three substances used in mixture with lanolin was influenced more pronouncedly by small variations in the environment or the state of vigor or development of the plant than by comparatively great variations in the concentration of the particular mixture used or in the amount of the mixture applied. There was less difference in this respect in the qualitative than in the quantitative response. Caution is required, therefore, in any endeavor to make a quantitative estimate of the amount of any of these substances which may be present in the living tissues of the plant if such estimate is based on a *quantitative response of tissues in close proximity to the place of application* or distant from it."

Stimulation of cambial activity, locally in the region of application and at a distance in relation to a wound, by means of heteroauxin, A. B. Brown and R. G. H. Cormack (*Canad. Jour. Res., 51 (1937), No. 9, Sect. C, pp. 433–441, pl. 1*).—"The application of heteroauxin in lanolin (1 mg of heteroauxin per gram of lanolin) to the distal end of disbudded cuttings of leader shoots of balsam poplar stimulated cambial activity for a distance of 1–1.5 in. below the point of application. Marked stimulation of local cambial activity, in relation to a bridged ring some considerable distance below the point of application of the heteroauxin, was also obtained. The response at the wound was distinct and separate from the response in the region of application of the heteroauxin, since in the intervening distance no cambial activity had occurred. The experiments were carried out during the winter months, so that the cambium was dormant in material as it came from the field. Cambial activity subsequent to treatment was estimated in terms of xylem formation. The structural features of this new xylem are described and discussed, with particular reference to the question as to whether heteroauxin stimulates cell division only in the cambium or, in addition, is active in differentiation of typical xylem elements."

Lanolin as a wound dressing for trees, G. M. Shear (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 286–288*).—In these trials by the Virginia Experiment Station hydrous lanolin, indoleacetic acid, white lead paint, and asphalt were used on cuts made at various places in sugar maple, linden, and seedling and Grimes Golden apple trees to determine their effects on callus formation. The transplanted trees of the first two species were too weakened for comparative results. On apple trees the growth of callus was noticeably better on wounds treated with lanolin alone, intermediate or much like the controls with lanolin plus indoleacetic acid, and least of any of the treatments with the paint. Most, if not all, of the beneficial effect of the lanolin appeared to be due to prevention of drying of the cambium and young callus. Apparently the concentration of indoleacetic acid used was too great to induce stimulation of the callus.

On the nature of inhibitions caused by auxin, K. V. Thimann (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 407–412, figs. 2*).—Inhibition of development in lateral buds of pea seedlings by pure auxin was not accompanied by compensating growth increase elsewhere and involved a real decrease in total dry weight. Inhibition of root elongation in oat seedlings by auxin was not due to a corresponding increase in thickness and also involved a decrease in total dry weight. Direct application of auxin in lanolin to the young lateral buds inhibited their growth as completely as did its application to the stem above the buds, but under such conditions very low concentrations may cause an increase in the weight of the buds. The extent of inhibition induced by a

given auxin concentration did not depend on the distance between the bud and the point at which it was applied to the stem.

In view of the parallel behavior of roots and buds with regard to auxin inhibition and the fact that very dilute solutions increase root elongation, it is suggested that roots, buds, and stems all behave comparably, their growth being inhibited by relatively high and promoted by relatively low auxin concentrations. The differences between them are believed to be quantitative rather than qualitative in nature. On this basis responses of different organs to auxin are presented as a series of optimum curves of similar shape.

Purification of traumatin, a plant wound hormone, J. Bonner and J. English, Jr. (*Science, 86 (1937), fig. 2233, pp. 352, 353*).—The authors propose the name "traumatin" for a highly active substance (approximately $C_{11}H_{17}O_4N$) extracted by described methods from dried bean pods and capable of producing an intumescence when applied locally to the lining of green bean pods.

Algae and growth-substances, M. A. Brannon (*Science, 86 (1937), No. 2233, pp. 353, 354*).—In tests at the University of Wisconsin, employing four monobasic growth substances in connection with inorganic synthetic culture solutions used with three species of unicellular algae, the author found pH 5.6–6.5 optimum in permitting growth stimulation in all cases where the concentrations did not exceed 1–100,000. Stimulation occurred in dilutions up to 1–3,000,000, but concentrations from 1–10,000 to 1–50,000 proved lethal.

Intermediates of vitamin B_1 and growth of Phycomyces, W. J. Robbins and F. Kavanagh (*Natl. Acad. Sci. Proc., 23 (1937), No. 9, pp. 499–502*).—This is a contribution from the University of Missouri.

The translocation of mineral elements in plants, O. F. Curtis (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 222, 223*).—This contribution by Cornell University is an abstract of a paper to be "published in full elsewhere."

Iron in the nutrition of higher plants, T. T. Demidenko (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 15 (1937), No. 5, pp. 267–271*).—The magnesium salt of alpha-pyrrole-carboxylic acid failed to replace iron functionally in corn seedlings. It was found that sunflower and oats accumulate iron before flowering, but that even if they continue to absorb it afterward, it is used synthetically to only a very limited extent. Iron sol may be retained in solution in the case of neutral or alkaline reactions by means of protective colloids, but the plant fails to absorb it on account of the considerable size of the sol molecule. Plants absorbing iron via the leaves or stems gave lower yields than those absorbing it via the roots. The effects of solutions of $Fe_2(SO_4)_3$ or $FeSO_4$ fed via the leaves were better than those of iron citrate or tartrate similarly introduced. It is concluded that higher plants assimilate iron sulfate and ferric and ferrous iron in equal measure.

Selenium absorption by plants and their resulting toxicity to animals, A. M. Hurd-Karrer (*Smithsn. Inst. Ann. Rpt., 1935, pp. 289–301, pls. 6*).—Previous published accounts of selenium absorption by plants and of selenium poisoning are reviewed (with 24 literature references), following which the author presents her own data on the amounts taken up by wheat and by various annual crop plants from sodium selenate added to the soil, on the selenium in successive crops cut from the same roots, and on the toxicity of selenium to plants in relation to sulfur (E. S. R., 77, p. 463). By sulfur treatments the entrance of selenium into the plants was greatly reduced, and it was apparent from the results obtained that its toxicity for plants was determined by the proportionate amount present with reference to sulfur. Possible explanations of such effects are presented. The high sulfur absorption of members of the mustard family was invariably associated with a high selenium

intake and the lower sulfur absorption of cereals with a lower selenium intake, while the legumes occupied an intermediate position.

Not only rats but also red spiders and aphids showed a disinclination to feed on selenium-containing plants. Algae grew well in solutions nourishing plants on which aphids died, and wheat mildew and smut attacked wheat plants containing relatively large amounts of selenium.

Zinc as a nutrient for plants, W. H. CHANDLER (*Bot. Gaz., 98 (1937), No. 4, pp. 625–646, figs. 5*).—This contribution by the University of California is "a summary of work that has been or is to be published in cooperation with D. R. Hoagland, P. L. Hibbard, J. C. Martin, and P. R. Stout." A bibliography of 59 titles is included.

Potassium and calcium in relation to nitrogen metabolism, G. T. NIGHTINGALE (*Bot. Gaz., 98 (1937), No. 4, pp. 725–734*).—This contribution by the Hawaiian Pineapple Producers' Experiment Station presents a general, critical review (with 20 literature references) of studies of the subject by various investigators, including the author. Potassium and calcium deficiency effects receive special attention.

Physiological studies in plant nutrition.—VI, The relation of respiration rate to the carbohydrate and nitrogen metabolism of the barley leaf as determined by nitrogen and potassium deficiency, F. G. GREGORY and P. K. SEN (*Ann. Bot. [London], n. ser., 1 (1937), No. 3, pp. 521–561, figs. 10*).—Continuing these studies (E. S. R., 76, p. 170), by use of sand cultures in which each treatment (described in detail) was replicated from 80 to 120 times (a total of 600 pot cultures), it was found that the respiration rate is greatly reduced in the nitrogen-deficient and greatly increased in the potassium-deficient series. The rate in successive leaves reached a maximum in the early leaves, fell to a minimum, and then increased in the last leaves. The respiration drift in the dark varied with the manuring and leaf succession.

For all leaves the mean values of the sugar fractions and the corresponding nitrogen fractions are given. Potassium deficiency led to much reduced sugar, to normal protein, and to much increased amino acid. Nitrogen deficiency led to much increased sugar and to much reduced protein and amino nitrogens. High respiration rate was associated with low sugar and high amino nitrogen in the potassium-deficient series, while low respiration accompanied high sugar and low nitrogen fractions in the nitrogen-deficient series.

"The results are examined statistically and the correlation coefficients, multiple regression coefficients, and regression equations are given. In the K_5 series with lowest potassium, sucrose content is the determining factor in respiration, in the K_3 series sucrose and protein N are significantly correlated with respiration; in the N-deficient series sugar content is uncorrelated, but protein N and amino N are highly correlated with respiration. In the control series amino N shows the highest correlation with respiration. The results are discussed in relation to the source of CO_2 in aerobic respiration. A schema is presented indicating the close relation of respiration and nitrogen metabolism. It is suggested that the CO_2 production is related to the rate at which a cycle of protein synthesis and proteolysis proceeds, the intermediate products of glycolysis being drawn into this metabolic cycle, and glycolysis is 'regulated' by the utilization of carbohydrate in this way."

Respiration of barley plants.—III, Protein catabolism in starving leaves, E. W. YEMM (*Roy. Soc. [London], Proc., Ser. B, 123 (1937), No. 832, pp. 243–273, figs. 9*).—The methods of estimation and changes of some of the important nitrogenous constituents in starving barley leaves are described, the results are discussed in relation to earlier experiments on carbohydrate exhaustion,

and some of the important biochemical mechanisms involved in the coordination of the carbohydrate and protein metabolism are indicated. An interpretation of the results consistent with present available data is summarized as follows:

"Hydrolysis of proteins is continuous in the detached starving leaves, and leads at first to the accumulation of soluble nitrogenous compounds most probably identifed as amino acids, glutamine, or peptides.. When a fall in carbohydrate concentration occurs, the primary products of hydrolysis are further decomposed, an important nitrogenous end product being at first stable amide, probably asparagine. Extreme carbohydrate exhaustion is associated with a rapid accumulation of ammonia, which may be a proximate cause of the death of the tissues."

The bibliography includes 46 references.

Anaphylaxis tests for differentiating the proteins of normal Solanaceae, K. S. Chester (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 451–454, figs. 3*).—The experiments described are believed to indicate that the proteins common to the Solanaceae and causing anaphylactic interreactions between the juices of many members of this family may be removed by suitable technics, and that when so removed it is possible to obtain a complete and clear-cut serological differentiation between certain genera of this family. This method of differentiation is suggested for experimental approach to such problems as the metabolism and movement of proteins in grafted plants, the serology of the plant viruses, and the genetic and taxonomic interrelationships of the Solanaceae.

Use of dextrose by excised tomato roots, W. J. Robbins and M. A. Bartley (*Science, 86 (1937), No. 2230, pp. 290, 291*).—It appears from studies here reported by the University of Missouri that excised tomato root tips can assimilate dextrose. This finding is considered of great interest from the standpoint of carbohydrate metabolism in general.

The chloroplastinsymplex and the formation of chlorophyll, W. A. Beck (*Protoplasma, 27 (1937), No. 4, pp. 530–533, fig. 1*).—"Photosynthesis seems to depend upon chlorophyll and its combination with a colloid carrier. Some factors are favorable for the activity of the chloroplastinsymplex and some are unfavorable. Light is necessary for the formation of chlorophyll in the higher plants. Pressure as such does not inhibit the formation of chlorophyll. Chlorophyll fails to develop in compressed carbon dioxide. The development is subnormal in compressed oxygen. It is above normal in compressed air. Fatigue sets in if the stimulation goes beyond the optimum time exposure. The stimulation may be due to conditions favorable to the chloroplastinsymplex. The fatigue may be due to depressed metabolic activity."

Localization of ascorbic acid in the cowpea plant at different periods of development, M. E. Reid (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 445–447*).—The highest ascorbic content in the cowpea plant (about 80 percent of the total) was found in the mesophyll of the leaves. The young ovary, the embryonic and elongating regions of root and stem, and the leaf and blossom buds were also high in content. The highest content in the ovaries was found about 2 days after blooming, decreasing to seed maturity.

Decomposition of ethylene chlorhydrin in potato tubers, L. P. Miller (*Contrib. Boyce Thompson Inst., 8 (1937), No. 6, pp. 479–492*).—Periodic analyses of potato tissue which had absorbed ethylene chlorhydrin indicated that the latter is rapidly decomposed in the tissue, although relatively very stable in expressed potato juice or in buffers at the pH of treated potatoes. About one-fifth or less of the absorbed chlorhydrin is given off unaltered in vapor form, while the rest is decomposed in the tissues at rates of 0.3–4 mg per 100 g of tis-

sue per hour. Increasing the amount of cut surface in potato tissue containing chlorhydrin increased the rate of decomposition. Subsequent determination of the chloride content of these pieces indicated that a large part of the chloride arising from the chlorhydrin occurs near the cut surface, thus showing the chlorhydrin decomposition to be more rapid at this surface. Analyses of whole tubers after decomposition of the absorbed chlorhydrin indicated that in whole tuber treatments also a large part of the additional chloride is found in the outer region of the tubers.

Recent advances in the physiology of latex, L. S. MOYER (*Bot. Rev., 3 (1937), No. 10, pp. 522–544*).—This critical review (with 103 literature references), contributed by the University of Minnesota, discusses the composition and occurrence of latex, its formation, its movement in intact vessels, its utilization by the plant, the flow of latex after tapping, and the specificity of latex particles.

The mechanism of bacteriophage production, A. P. KRUEGER (*Science, 86 (1937), No. 2234, pp. 379, 380*).—In this contribution from the University of California it is shown that multiplication of a bacteriophage may at times proceed actively after bacterial cell multiplication is brought to a standstill, permitting study of the cellular mechanism of phage formation in the same way as for enzyme formation.

Notes on southern Appalachian fungi, II, L. R. HESLER (*Jour. Tenn. Acad. Sci., 12 (1937), No. 3, pp. 239–254, figs. 5*).—Since the publication of an earlier report (E. S. R., 75, p. 790), a number of rare or otherwise interesting fungi have come to light and are included in this annotated list, presented by the University of Tennessee. Noteworthy extensions of range are reported for several species.

An enumeration of Philippine fungi, N. G. TEODORO (*Philippine Dept. Agr. and Com., Tech. Bul. 4 (1937), pp. 585*).—The expressed purpose of this monograph was to bring together all known Philippine fungi and all references to species credited to the Archipelago published prior to 1935. Fungi identified in or for the Bureau of Science, the Bureau of Plant Industry, and the College of Agriculture which have not been published are also included.

Following the introduction, which includes a historical survey of Philippine mycology, the work presents a bibliography of Philippine fungi, a list of authors, the annotated enumeration of fungi by main groups (exclusive of bacteria, Myxomycetes, and lichens), which takes up the main body of the text, a numerical summary of the fungi by groups, a host index, an index to fungi without organic hosts, and the general fungus index.

Cell inclusions and life cycle of Azotobacter, I. M. LEWIS (*Jour. Bact., 34 (1937), No. 2, pp. 191–205, figs. 6*).—The stainable granules in *Azotobacter* cells consist of volutin, while the nonstainable ones are fat bodies. Neither gonidia nor visible chromidia occurred, and appearances resembling conjugation were due to incompleted fission. The so-called symplasm is said to consist of gum, cell walls, fat bodies, volutin balls, and cellular elements. Transmutation of cells to a different type cultivable as such to form culture phases differing from the original did not occur in any of the several strains tested. Reproduction is by binary fission and by arthrospores. The life history of *Azotobacter* is very simple.

Symbiotic nitrogen-fixation by the Leguminosae, P. W. WILSON (*Bot. Rev., 3 (1937), No. 8, pp. 365–399*).—This contribution from the University of Wisconsin constitutes a critical review of the subject, with 128 literature references. The three research periods noted revolve around (1) the question as to whether green plants are able to utilize free nitrogen, (2) the agronomic applications

of nitrogen fixation by legumes, and (3) the theoretical and basic aspects of the problem. The discussion, concerned mainly with the third period, analyzes the available data on the physiology of the organisms (nitrogen fixation, and growth and respiration), the plant-bacterial relationships (cross-inoculation groups, host-plant specificity, and bacteriophage), and the mechanism of symbiotic nitrogen fixation (the carbohydrate-nitrogen relation, isolation of intermediates, enzyme systems, role of minerals in symbiotic nitrogen fixation, and cytological aspects of the problem). It is believed that encouraging progress has been made, but the danger from uncritical thinking in the analysis of results is stressed.

Mechanism of symbiotic nitrogen fixation.—I, The influence of pN_2, P. W. Wilson (*Jour. Amer. Chem. Soc., 58 (1936), No. 7, pp. 1256–1261, fig. 1*).—"The relation of the partial pressure of nitrogen to fixation of the free element by the symbiotic system in red clover has been studied over the range of pN_2 from 0.04 to 1.56 atm. [atmospheres] in the presence of no added gas, helium, and argon. Statistical analyses of data from 11 experiments indicate that the fixation of nitrogen is essentially independent of pN_2 when the latter exceeds 0.10 to 0.20 atm., but decreases rapidly with pN_2 as the latter is diminished below 0.10 atm. This pN_2 function is characteristic of the nitrogen-fixing process, since it is not observed in plants supplied with combined nitrogen. The implications of these observations for the mechanism of the symbiotic-fixation process are discussed."

Mechanism of symbiotic nitrogen fixation.—II, The pO_2 function, P. W. Wilson and E. B. Fred (*Natl. Acad. Sci. Proc., 23 (1937), No. 9, pp. 503–508, fig. 1*).—"Comparison of the pO_2 function of red clover plants fixing elemental nitrogen with that of plants assimilating combined nitrogen indicates that the functions are essentially similar, which leads to the conclusion that molecular oxygen is not directly concerned in the symbiotic nitrogen fixation process in these plants. Accordingly all proposed mechanisms involving molecular oxygen will have to be discarded. Oxygen, however, is important for the fixation reaction in an indirect manner, especially as it influences the carbohydrate metabolism of the host plant [E. S. R., 75, p. 21]. . . . Evidence is presented that inhibition of symbiotic nitrogen fixation by hydrogen may be connected with effects on the oxidative mechanisms in the host plant."

The physical basis of mycotrophy in Pinus, A. B. Hatch (*Black Rock Forest Bul. 6 (1935), pp. X+168, pls. 2, figs. 36*).—Following a comprehensive review of the literature of mycorhizal research (with nine pages of references), the author details his soil-culture and pure-culture experiments with the mycorhizas of pines. His tests with prairie soil provided evidence that mycorhizas are concerned with the absorption of mineral salts, and that pines are incapable of absorbing sufficient nutrients to maintain normal growth in some soils when mycorhizal fungi are lacking. In the pure-culture tests (methods and apparatus described) it was indicated that pine seedlings grown in sand were apparently capable of utilizing peptone and nucleic acid under the experimental conditions. The pure cultures of mycorhizas were produced in quantity in sand substrates possessing appreciable base-exchange properties and rich in undissolved minerals, but not in inert sand substrates low in base-exchange capacity and lacking in insoluble minerals or to which dissolved minerals had been added. The "absorbing" surface of short roots was found to be increased by mycorhizal infection through continued elongation, increase in diameter, multiple tip development, prolongation of the life of the cortex, and through acquirement of the surface areas of the mycorhizas.

From the study as a whole, the following tentative and in part theoretical interpretations are advanced: The mycotrophic relationship in pines, and pre-

sumably in other plants with ectotrophic mycorhizas, is a symbiotic mechanism which increases the absorption of soil nutrients. The greater absorption capacity of mycorhizal seedlings is effected by increases in the absorbing surface areas of the short roots. The magnitude of the surface area of short roots is determined by the availability of soil nutrients. In fertile soils mycorhizas are rarely produced and long root tips serve as the chief absorptive organs, whereas in infertile soils mycorhizal short roots become numerous, their number and development being inversely proportional to the fertility. As the availability of nutrients decreases, the mycorhizal short roots assume an increasing share in seedling nutrition and eventually become the only absorptive organs. The superior efficiency of fungi as compared with roots in extracting nutrients from insoluble rocks and base-exchange materials is believed to center primarily in the fact that the "surface area : volume" ratio is vastly greater in fungi than in roots, and only secondarily in any peculiar fungal physiology. The benefits to the fungi from such association with tree roots are probably in the nature of growth-promoting substances. Susceptibility to mycorhizal infection is apparently controlled indirectly by the internal concentration of nutrients in the short roots. It is believed that trees are dependent on symbiotic association with mycorhizas for their soil nutrients and therefore for their existence in all but the most fertile crop soils. The probable significance of these phenomena in forestation is suggested.

Morphology of Cupressus arizonica: Gametophytes and embryogeny, C. C. Doak (*Bot. Gaz., 98 (1937), No. 4, pp. 808–815, figs. 14*).—This is a contribution by the Texas A. and M. College.

The morphology and anatomy of the dahlia seedling, A. L. Havis (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 592–594, fig. 1*).—In this preliminary report by the Ohio Experiment Station, data are presented on the morphology of the seedling and the anatomy of the roots, hypocotyl, cotyledonary node, and epicotyl of *Dahlia pinnata*. The primary vascular system in series from the base of the hypocotyl into the cotyledons is illustrated.

A quantitative study of the roots and root hairs of a winter rye plant (Secale cereale), H. J. Dittmer (*Amer. Jour. Bot., 24 (1937), No. 7, pp. 417–420*).—In this study counts were made by categories (main, secondary, tertiary, and quaternary) to determine the total number of these roots by ranks on a single rye plant. "The 13,815,672 roots had a surface area of 2,554.09 sq. ft. Diameters of roots were characteristic of the categories to which they belonged. Living root hairs on this plant numbered 14,335,568,288 and had a total surface area of 4,321.31 sq. ft. They covered all roots of each category, but they occurred in greatest number on roots of the quaternary division. The root hair surface combined with that of the roots gave a total of 6,875.4 sq. ft., which was the area of possible soil contact for this plant. The total external surface of the 80 shoots with their 480 leaves was 51.38 sq. ft.; the surface area of subterranean parts was therefore 130 times that exposed by the top."

The protective layers of the apple, H. P. Bell (*Canad. Jour. Res., 15 (1937), No. 8, Sect. C, pp. 391–402, figs. 10*).—"The development of the four protective layers of the apple, namely, the hairs, cuticle, epidermis, and hypodermis, is described in detail, from the time the flower emerges from the winter bud early in May until harvest time early in October. The gradual loss of living and active cell contents is recorded for each layer. Measurements of cuticle thickness for the period of the study are listed, and an approximate date is given for each stage of development. The descriptions of tissue morphology are supplemented by 10 illustrations."

GENETICS

The physiology of heterosis, E. Ashby (*Amer. Nat., 71 (1937), No. 736, pp. 514–520*).—A discussion of the physiology of heterosis based on hybrid vigor induced in corn from crossing strains and in swine from crossing breeds.

Can artificial selection produce unlimited change? H. D. Goodale (*Amer. Nat., 71 (1937), No. 736, pp. 433–459, figs. 4*).—Progress made by selection in increasing the number of bristles on the scutellum of *Drosophila* and the extent of the skin areas on the head producing white hairs in mice suggests unlimited possibilities of selection. Whether the progress was made by recombination of genes or by the selection of desired mutations seems immaterial.

The chromosomes in spermatogenesis of domestic asses [trans. title], I. Sokolov (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 15 (1937), No. 6–7, pp. 359–362, figs. 5*).—Studies of the chromosome numbers in testicular tissue from two asses showed the haploid number to be 32 and the diploid number 64.

The occurrence of a dominant spotting mutation in the house mouse, C. C. Little and A. M. Cloudman (*Natl. Acad. Sci. Proc., 23 (1937), No. 10, pp. 535–537*).—An exceptional spotted male with irregular white spots was produced in a strain of silver-black self mice of the formula *wwBBslslSS*. The black-eyed whites produced in matings of the exceptional male with his sister lived about twice as long as regular black-eyed whites, and one lived to maturity. The new type of spotting was assumed to be due to another gene, *W′*, allelic to the dominant white-spotting gene *W*. The ground color of *BB* mice carrying *W′* was more brown and gray than the clear, deep black of *BB* animals.

A third lethal in the T (Brachy) series in the house mouse, L. C. Dunn (*Natl. Acad. Sci. Proc., 23 (1937), No. 9, pp. 474–477*).—Data are presented in support of a third allel in the brachyury series in the house mouse. When homozygous, all three allels—*T*, *t′*, and t^{o}—are lethal at early ages, and consequently tailless individuals carrying them are heterozygous but breed true because of the balanced lethal condition. T^{f}, the gene for fused, is also allelic and reduces viability when homozygous.

The use of inbred fowls for top-crossing, N. F. Waters (*Poultry Sci., 16 (1937), No. 5, p. 348*).—In studies at the Iowa Experiment Station, Leghorns produced by topcrossing inbred sires with other birds of the same species showed better fertility, hatchability, and mortality to 8 weeks than inbreds or other noninbreds.

Rate of feathering in chickens, its inheritance and correlation with certain characters of full-grown Greenleg fowls, L. Kaufman (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Palawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 16 (1935), No. 1, pp. 205–222, fig. 1; Eng. abs., pp. 219–222*).—Differences in the rate of feathering in the Polish Greenleg fowl were sex-linked and were similar to those observed by Warren between breeds (E. S. R., 72, p. 172). In the Greenleg fowls, several autosomal genes operated to complicate the determination of the rate of feathering by the sex-linked genes.

Inheritance of plumage colour and certain physiological characters in two varieties of the Polish Greenleg fowls, L. Kaufman (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Palawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 16 (1935), No. 1, pp. 191–204, figs. 2; Eng. abs., pp. 201–204*).—The four possible matings between cocks and hens of the light and dark variations of the head and cape feathers of the Polish Greenleg fowl were made to study the mode of inheritance of the contrasting characteristics and the relation of color to egg

production and vigor. Body weight and first year egg production were greater in the hens of the dark variety. Differences in the head and cape feathers of the light and dark varieties were apparent in the hens and in the young cockerels, but there was no difference in full-grown cocks. The dark-plumage character was dominant to light plumage.

Color-producing genes in White Silkie and White Rose Comb Bantam, J. P. QUINN and A. B. GODFREY (*Poultry Sci., 16 (1937), No. 5, pp. 340–344*).—The F_2 progeny produced at the U. S. D. A. National Agricultural Research Center, Beltsville, Md., from matings of four strains of White Silkies with colored fowls were classified as 1,748 with colored down and 600 with white down. The backcross consisted of 717 white and 715 colored birds. In crosses of White Rose Comb Bantams with colored breeds, the down color of the F_2 chicks was 91 colored and 35 white. The backcross chicks were 65 white and 67 colored. A single factor difference between the parental types therefore explained the results, and White Silkies and White Rose Comb Bantams are suggested as *ccOO*. These results indicate the diversity in the different strains of white breeds in respect to their genotype for plumage color.

Note on a Bronze-Bourbon Red mosaic, V. S. ASMUNDSON (*Jour. Genet., 35 (1937), No. 1, pp. 25–30, pls. 3*).—A mosaic turkey female with bronze on the head, neck, shoulders, tail, and part of the rump, and some patches of bronze feathers surrounded by red on the wings, with a continuous band of feathers typical of the Bourbon Red variety around the rest of the body, occurred in the F_2 generation from a cross of a Bronze male × Bourbon Red female at the California Experiment Station. The difference in the plumage character of the two varieties was due to a single pair of autosomes, the segregation in the F_2 being one Bronze to two F_1 pattern to one Bourbon Red type. In the backcross, equal numbers of the F_1 and backcross types were produced. When the mosaic female was mated with a Bourbon Red male, all the progeny had Bourbon Red plumage. The possibilities of nondisjunction, gene mutation, and somatic segregation are discussed.

An experimental study of plumage in Reeves pheasants, C. H. DANFORTH (*Jour. Expt. Zool., 77 (1937), No. 1, pp. 1–11, figs. 2*).—Reeves pheasants occupy a position intermediate between species in which secondary sex plumage characters are regulated purely by genetic factors and purely by hormones. Four distinct types of plumage were found, (1) normal male, (2) normal female, (3) female skin grafted on a male, and (4) male skin grafted on a female. Intermediate patterns and regional differences in response were produced by varying the female hormones by ovariectomy or the administration of theelin. Definite evidence of a response to male hormones was not clear. Sex differences in the effects of extragonadal hormones are suggested.

Growth and life span of the field mouse, W. J. HAMILTON, JR. (*Amer. Nat., 71 (1937), No. 736, pp. 500–507, figs. 4*).—Data are presented on the life span, breeding habits, and size at sexual maturity of the field mouse, *Microtus pennsylvanicus pennsylvanicus*. The short life span was attributed to the attainment of sexual maturity at an early age, the extreme prolificacy, and little cessation of activity while the animal was searching for food.

The effect of cysteine on hereditary hypotrichosis in the rat (Mus norvegicus), E. ROBERTS (*Jour. Biol. Chem., 118 (1937), No. 3, pp. 627–630, figs. 2*).—Feeding one individual in each of 24 pairs of hairless rats with from 5 to 6.5 mg of cysteine hydrochloride daily showed no effect on hair growth in studies at the Illinois Experiment Station.

The structure of the secreting and retrogressing mammary gland in the guinea pig, C. HESSELBERG and L. LOEB (*Anat. Rec., 68 (1937), No. 1, pp. 103–

112).—Histological changes are described as observed in the secreting and retrogressing mammary gland, and in the gland following removal of young and ligation on one side.

The vaginal smear picture, sexual receptivity, and the time of ovulation in the guinea pig, W. C. YOUNG (*Anat. Rec., 67 (1937), No. 3, pp. 305–325, fig. 1*).—A study of the vaginal changes, sexual receptivity, and ovulation in guinea pigs for a period of from 2 to 6 mo. showed that no vaginal picture was associated with sufficient definiteness with heat to make this method of diagnosing ovulation fully accurate. Frequent examination for copulatory response was the only certain way of detecting heat. Ovulation seemed to be associated with heat rather than with a given vaginal condition, and therefore the smear cannot be relied upon to indicate the time of ovulation. In fact, it was suggested that vaginal changes and heat are separable and vaginal changes were modified by frequency of examination. Modifications in the commonly accepted stages of the oestrous cycle were recognized, but wide variations existed between the smear picture and the occurrence of heat and ovulation, even after such classifications were made.

Experimental studies on spermatogenesis in the house sparrow, Passer domesticus (Linnaeus), G. M. RILEY (*Anat. Rec., 67 (1937), No. 3, pp. 327–351, pls. 2, figs. 2*).—Variations in the amount of spermatogenesis in the sparrow were associated with light and variations in body temperature (E. S. R., 76, p. 320). Spermatogenic activity was closely related to a lowering of body temperature at night.

The speed of travel of ram spermatozoa, R. W. PHILLIPS and F. N. ANDREWS (*Anat. Rec., 68 (1937), No. 1, pp. 127–132*).—A more detailed report is given from the Massachusetts Experiment Station on the rate of travel of spermatozoa (E. S. R., 77, p. 770). Spermatozoa from rams and rats were mixed and diluted in Ringer's solution and injected into the anterior portion of the vaginas of seven ewes. The ewes were slaughtered at different intervals and ram sperm were found in all sections of the fallopian tubes within 30 min., which was the shortest interval tested. Rat spermatozoa traveled more slowly and degenerated more rapidly and were present in the tubes of only three of the ewes. Ram spermatozoa traversed in a glass tube a distance comparable to the length of the genital tract of the ewe (38.1 cm) in 76.69 min. The rate of travel in vitro, 4.83 mm per minute, was slower than in vivo, and speed of travel in the genital tract was much more rapid than the time reported by Green and Winters (E. S. R., 75, p. 469).

The technique of artificial insemination in cattle and sheep, J. ANDERSON (*East African Agr. Jour., 3 (1937), No. 2, pp. 120–128, figs. 11*).—This article describes methods which have been satisfactorily employed in the artificial insemination of cattle and sheep. The discussion deals with the collection of semen from the bull or ram by means of an artificial vagina; the examination, dilution, and storage of the sperm; and the methods of insemination. The equipment required for carrying out this technic is indicated.

Artificial insemination of ewes at a distance, R. PRAWOCHEŃSKI and A. WALTON (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Palawach (Mém. Inst. Natl. Polon. Econ. Rurale Pulawy), 16 (1935), No. 1, pp. 265–276, figs. 5; Eng. abs., p. 276*).—A further account of artificial insemination of Polish ewes with semen from a ram in England (E. S. R., 77, p. 37).

Congenital absence of one-half of the scrotum in a dog, C. W. HOOKER, J. M. DOUGLAS, and R. D. KORNEGAY (*Anat. Rec., 69 (1937), No. 1, pp. 1–3, figs. 2*).—A dog with one descended testicle and only one-half of the scrotum evident and the other testicle retained in the abdomen is described.

Follicular growth rate and ovulation after various experimental procedures in the guinea pig, E. W. Dempsey (*Amer. Jour. Physiol., 120 (1937), No. 1, pp. 126–132, fig. 1*).—Studies of the effects of various treatments on the follicular growth in the guinea pig showed that follicular growth was abolished by hypophysectomy. The preovulatory swelling and ovulation were prevented by pregnancy or injections of progesterone. The basic growth rate of follicles during the cycle was not influenced by pregnancy, removal of the corpora lutea, or injections of progesterone, oestrin, or the male hormones.

The influence of pseudopregnancy on follicular sensitivity to pregnancy urine extracts, G. L. Weinstein and A. W. Makepeace (*Amer. Jour. Physiol., 119 (1937), No. 3, pp. 508–511*).—Rabbits were about one-third to one-half as sensitive to pregnancy urine extract from the fifth to the fifteenth day of pseudopregnancy as normal postpartum rabbits. The failure of postcoital ovulation in pseudopregnant rabbits seems to be due to some influence, probably corpus luteum hormone, preventing in part or completely the postcoital pituitary gland discharge.

Inhibition of the gonadotropic activity of pregnancy urine extract by the serum of rabbits injected with an extract of male urine, P. de Fremery and B. Scheygrond (*Nature [London], 139 (1937), No. 3528, pp. 1015, 1016*).—The administration of serum from a female rabbit previously injected for 30 days with a concentration of human male urine prevented oestrus, enlargement of the uterus, and luteinization in rats simultaneously injected with gonadotropic hormone from human pregnancy urine. Serum from rabbits treated with serum from a nonpregnant mare failed to inhibit the gonadotropic activity of pregnant mare serum in immature female rats.

Inhibition of estrous cycle in the rodent with post-partum urine and commercial prolactin, I. T. Nathanson, H. L. Fevold, and D. B. Jennison (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 481–483*).—The injection of post partum urine from women into rats and mice with normally recurring oestrous cycles suppressed the occurrence of from one to three cycles, after which normal oestrous rhythm was resumed regardless of the dose of urine injected. Human urine from normal females and males had no effect on the cycles. Commercial prolactin also inhibited the cycle rhythm but for a longer time than post partum urine. As a result of studies along this line it is suggested, although not proved, that an inhibition of the cycle is due to the luteinizing hormone rather than to the prolactin in the post partum urine.

Temporary suppression of estrous cycles in the rat by prolactin, E. L. Lahr and O. Riddle (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 880–883, fig. 1*).—Prolactin was found to suppress from one to two oestrous cycles in rats, followed by their normal recurrence. Oestrous cycles were not suppressed by moderate doses of progesterone.

Effect of route of administration of the bioassay of prolactin, R. W. Bates and O. Riddle (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 847–849*).—In a comparison of different methods of administration of prolactin to young pigeons, subcutaneous and intracutaneous injections were about 11 times as efficient as intravenous injections, about 5 times as efficient as intramuscular injections, and about 8 times as efficient as intraperitoneal injections.

A quantitative method for the bioassay of progestin, G. Pincus and N. T. Werthessen (*Amer. Jour. Physiol., 120 (1937), No. 1, pp. 100–104, figs. 2*).—A precise index was suggested for progestin activity, based on the ovum size and the degree of glandular proliferation of the uterine mucosa of rabbits ovariectomized from 18 to 20 hr. after mating and treated for 3 days with the test material. The combined index permits the detection of 0.38 mg of progesterone.

Effect of progestin upon the mammary glands of the mouse, W. U. Gardner and R. T. Hill (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 718–720*).—Growth of the mammary glands in mice was stimulated by the administration of extracts of progestin or a crystalline preparation of progesterone when theelin was also supplied.

Effect of progesterone on cell-division in the uterine epithelium, C. W. Lloyd (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 190, 191*).—Daily injections of 0.5 mg of progesterone crystals for 3 days into female rabbits following ovariectomy increased the number of mitotic cell divisions in the uterine epithelium about 50 times as compared with the controls and other animals receiving oestrin injections.

The inhibition of estrous cycles in the albino rat by progesterone, W. A. Phillips (*Amer. Jour. Physiol., 119 (1937), No. 3, pp. 623–626, fig. 1*).—Daily doses of 0.25, 0.5, and 1.0 mg of crystalline progesterone administered to female rats with regularly recurring oestrous cycles had no influence on subsequent cycles. Further oestrous cycles were inhibited by doses larger than 1.5 mg, but resumed as soon as the progesterone administration was stopped.

Oestrous reactions, including mating, produced by triphenyl ethylene, J. M. Robson and A. Schönberg (*Nature [London], 140 (1937), No. 3535, p. 196*).—A note is made of the induction of oestrus and mating in ovariectomized mice and hypophysectomized rabbits by the administration of triphenyl ethylene, per os or subcutaneously.

Rhythmic diurnal variations in the oestrous phenomena of the rat and their susceptibility to light and dark, A. M. Hemmingsen and N. B. Krarup (*K. Danske Vidensk. Selsk., Biol. Meddel., 13 (1937), No. 7, pp. 61, figs. 4*).—In rats, heat and rhythmic spontaneous activity associated with oestrus were found to be greatest at night. Spontaneous activity, mating instinct, and vaginal changes in both albino and brown females were shifted 12 hr. if the animals were exposed to light at night and darkness in the daytime. Activity was also greatest in the male at night. The 24-hr. activity rhythm was not abolished by the alternation of 8 hr. of dark and 8 hr. of light. Consideration is given to the influence of light on the seasonal sexual rhythm of some animals with a restricted mating season.

The effect of the quality of protein on the estrous cycle, P. B. Pearson, E. B. Hart, and G. Bohstedt (*Jour. Nutr., 14 (1937), No. 4, pp. 329–339, figs. 6*).—In experiments at the Wisconsin Experiment Station, thrifty young rats reared on an adequate stock diet were placed on a ration containing 5 percent of casein as the chief source of protein, one group being changed at the second period of oestrus (approximately 50 days of age) while two other groups were not changed until they were 100 days or more of age. All animals on the casein diet soon ceased to exhibit the characteristic vaginal changes of oestrus, and histological studies revealed hypotypical ovaries and atrophic condition of the whole reproductive system. Ovulation did not occur as indicated by atretic follicles and the absence of new corpora lutea. The addition of gelatin, rich in lysine, at either 5- or 10-percent levels to the casein diet brought about only a partial response in restoring the oestrous cycle. The addition of 5 percent of gliadin, poor in lysine, caused an immediate resumption of ovulation and normal sexual rhythm, indicating that an amino acid deficiency other than lysine results in aberration of the oestrous cycle. Apparently no permanent sterility results from feeding protein-deficient diets if the factors essential for ovulation are subsequently provided.

Method of preparing mice for quantitative determination of urinary estrogen, A. Palmer (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 123–*

127).—By overstimulation and persistent stimulation, mice may be maintained in a maximum state of reactivity for quantitative determination of urinary oestrogen.

Transmission of estrogenic substances from animal to animal, I. H. Perry and A. Palmer (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 122, 123*).—It was determined that oestrin might be transmitted from treated animals from the skin and excreta through the skin and mouth in sufficient amounts to bring spayed female rats into active oestrus. The necessity of isolating test animals is, therefore, indicated.

Hypertrophy of interstitial cells in the testes of mice receiving estrogenic hormones, W. U. Gardner (*Anat. Rec., 68 (1937), No. 3, pp. 339–347, figs. 5*).—Injections of large doses (about 500 international units) of oestrogens, namely, theelin, theelol, keto-oestrin benzoate, hydroxyoestrin-benzoate, equiline-benzoate, and equiline, into male mice of five different strains were found to cause extensive damage to the seminiferous tubules of the testes with more or less replacement by large interstitial cells, the physiological activity of which was undetermined. Marked differences were noted in the response of the different strains to the oestrogen injections.

Effect of small doses of oestrin upon ovarian and vaginal cycles of mature rats, L. L. Button and C. I. Miller (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 835–839*).—Daily injections of small doses of oestrin (Progynon-B), from ¼ to 2 rat units per day, into mature female rats disturbed both the ovarian and vaginal cycles by reducing the incidence of ovulation and inducing periods of continued anoestrus or oestrus.

Effects of ovariectomy on body growth and organ weights of the young albino rat, C. B. Freudenberger and P. M. Howard (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 144–148, fig. 1*).—Spaying female rats at an average age of 26 days resulted in a significant difference in body weight and tail length as compared with normals. The difference in body weight between the control and spayed groups constantly increased to 13 weeks of age, when it was 20.5 percent. The differences at this age were greater in several body parts than at 6 mo. of age, suggesting that spaying produced more rapid growth changes than occurred in the controls.

Maternal behavior in hypophysectomized male and female mice, C. P. Leblond and W. O. Nelson (*Amer. Jour. Physiol., 120 (1937), No. 1, pp. 167–172*).—By the use of a maternal index, based on the care and attention given to a young animal dropped in the cage, it was found that the maternal instinct persists for a considerable period after hypophysectomy in lactating mice and rats and was initiated in males and females following hypophysectomy.

Functional pituitary grafts in rats, R. O. Greep (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 754, 755*).—Pituitary tissue grafted into hypophysectomized rats permitted normal reproduction in males and females.

The effects of hysterectomy on mammary gland development in a rabbit, J. L. Gillard (*Amer. Jour. Physiol., 120 (1937), No. 2, pp. 300–303, figs. 4*).—Corpora lutea were found to last longer in hysterectomized virgin rabbits than in normals, and pseudopregnancy continued for 25 days in such animals as contrasted with only 18 days in the normal animals. Primary duct proliferation occurred within 24 hr. after ovulation and was thought to be an oestrin reaction, whereas the subsequent lobule formation in both nonhysterectomized and hysterectomized rabbits was considered due to progestin stimulation. Repeated oestrous cycles and repeated pseudopregnancy were induced by mating hysterectomized females.

Experimental studies of the thyroid.—I, Effects of thyroidectomy on reproductive organs in males of an annual-breeding ground squirrel, M. ZALESKY and L. J. WELLS (*Anat. Rec., 69 (1937), No. 1, pp. 79–97, pl. 1*).—Eight of eleven male ground squirrels thyroidectomized during the quiescent period exhibited no spermatogenesis or testis hormone production during the active breeding season. Males from which the thyroids were not completely removed underwent varying degrees of sexual development. The thyroid seems essential for the development and function of the male reproductive organs in this wild animal with an annual sexual cycle.

Hypophysis-thyroid-gonad relationship, S. L. LEONARD (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 599, 600*).—Crude hypophyseal extract containing both follicle-stimulating and thyrotropic hormones, was much more effective in stimulating growth in the ovary and uterus in thyroidectomized than in normal rats.

Comparison of methods of extraction of the lactogenic hormone, A. J. BERGMAN and C. W. TURNER (*Jour. Biol. Chem., 118 (1937), No. 1, pp. 247–251*).—The efficiency of four methods of extraction of the lactogenic hormones from sheep anterior pituitary powder was compared at the Missouri Experiment Station. The method of Bates and Riddle, involving extraction with from 60 to 70 percent alcohol at a pH of from 9 to 10, yielded the best recovery of the hormone, and there was little loss in the residue.

The lactogenic preparations from the anterior pituitary and the increase of milk yield in cows, G. J. ASIMOV and N. K. KROUZE (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 289–306, figs. 5*).—Results are reported from the All-Union Institute of Animal Husbandry, Moskva (Moscow), on the effects of injections of extracts of whole anterior pituitary from cattle on the milk yield in 510 cows varying in age and breed at four State farms. Ninety cows were reserved as controls.

The subcutaneous injection of an extract equivalent to about 6 g of the gland resulted in marked increases in the milk yield without significant changes in the quality of the product, except that the butterfat increased slightly as compared with the control animals and the yields of the same animals prior to and just after treatment. The lactogenic substances seemed noninjurious, produced increases as great as seven or more liters of milk per day, and were effective in repeated injections in the same animal. Extracts of the pituitaries were most effective in stimulating milk yield during the first half of lactation and in well-kept cattle.

The composition of rabbit milk stimulated by the lactogenic hormone, A. J. BERGMAN and C. W. TURNER (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 21–27*).—The results of two studies by the Missouri Experiment Station are presented in this report. In the first of these, the individual glands of rabbits which had been induced to lactate experimentally by injections with the lactogenic hormone were analyzed for lactose content. Rating the extent of mammary development according to a previously described method (E. S. R., 70, p. 35), 1+ glands contained 0.05–0.14 percent of lactose, 2+ glands about 0.15–0.35, 3+ glands about 0.36–0.75, and 4+ glands 0.76–1 percent of lactose.

A comparison of the composition of milk secreted by rabbits after parturition with that of milk experimentally initiated by the lactogenic hormone indicated that milk from a 4+ gland was similar to normal colostrum in lactose and total solids content but lower in ash and higher in fat. The lactose content of the milk increased as the rating of the glands increased.

Studies of prolactin in the fowl pituitary, I, II (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 841–846, fig. 1*).—The following two sections are included here:

I. *Broody hens compared with laying hens and males*, W. H. Burrows and T. C. Byerly (pp. 841–844).—Following the demonstration of the relation of prolactin to broodiness by Riddle, Bates, and Lahr (E. S. R., 76, p. 25), investigations comparing broody hens with laying hens and males showed that the pituitaries from broody hens caused a greater reaction in the pigeon crop gland test for prolactin than pituitaries from males and laying hens.

II. *Effects of genetic constitution with respect to broodiness on prolactin content*, T. C. Byerly and W. H. Burrows (pp. 844–846).—Further studies on the effects of genetic constitution with respect to broodiness on prolactin content showed a higher crop-gland-stimulating potency from the pituitaries from laying hens which had previously been broody than from laying hens presumably of a nonbroody genotype. Differences in the reaction from pituitaries of males presumably with and without the genetic factor for broodiness could not be demonstrated.

Heme containing fractions of blood as related to the augmentation of pituitary gonadotropic extracts, W. H. McShan and R. K. Meyer (*Amer. Jour. Physiol., 119 (1937), No. 3, pp. 574–579*).—Heme and hemin greatly augmented the action of gonadotropic extracts of the pituitary on the size of the ovaries of immature rats when jointly administered, but were without augmentation if not mixed before absorption. Whole blood cells and hemoglobin, although slightly less effective, had strong augmentive effects. Porphyrin and globin from hemoglobin and ferrous and ferric chloride were without augmentive properties.

Effect of lactogenic hormone on embryonic tissues cultivated in vitro, A. J. Salle and I. L. Shechmeister (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 603–606*).—Attempts to stimulate embryonic chick connective tissue, embryonic chick epidermis, and embryonic pigeon oesophageal epithelium and crop epithelium in vitro by lactogenic hormones were entirely negative.

A colorimetric assay for male sex hormones in urine, R. B. Oesting (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 524–526*).—A colorimetric method is described for the assay of the male sex hormone which shows a satisfactory correlation with assays by the capon test. It is deemed more sensitive and requires a less complicated set-up than the capon test.

Prostatic type of paraurethral glands induced in female rats by administration of male sex hormone, J. B. Hamilton and J. M. Wolfe (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 465–468*).—Skene's ducts, normally rudimentary in the female rat, were found to respond to the administration of testosterone propionate or acetate with or without crystalline oestrone to a condition resembling the prostate of the male rat. The condition of Skene's gland furnishes a method of measure of the male hormone effects in the female.

Comparative studies of gonadotropic hormones, IV, V (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 691–694, 732–734*).—The effects of extracts of anterior sheep pituitary and the blood of pregnant women on female rats are described in continuation of this series.[2]

IV. *Ovaries and hypophyses of rats in chronic experiments*, C. F. Fluhmann.—The administration of sheep anterior pituitary extract caused atrophy of the ovaries and increased the weight of the hypophysis with the appearance of castration cells, whereas injections of a gonadotropic extract from human pregnancy blood caused increased weight of the ovaries and hypophysis with histological changes in the chromophobes and eosinophilic cells.

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[2] Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 9, pp. 1193–1195; 30 (1933), No. 8, pp. 1014–1016, fig. 1; Amer. Jour. Physiol., 106 (1933), No. 1, pp. 238–246, figs. 2.

V. *Growth response of rat mammary glands in chronic experiments*, N. J. Howard.—Anterior pituitary extracts caused growth and proliferation of the duct system but without alveolar or lobule growth in the mammary gland. With human pregnancy blood extracts there were secretory changes and milk production.

Concentration of gonadotropic substance from pregnancy urine, H. L. Fevold and F. L. Hisaw (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 712–714*).—The cresol extraction of the follicle-stimulating hormone from the urine of pregnant women is described.

The influence of the female sex hormone on fertility development and ovulation [trans. title], W. Koch (*Arch. Geflügelk., 11 (1937), No 6, pp. 177–202; Eng. abs., p. 201*).—The oral administration of small doses of follicular hormone in the form of unden had no influence on egg production or hatchability in the fowl. However, in large doses reproduction was influenced to the extent that two eggs were laid in 1 day in several cases, but fertility and hatchability were impaired. Medium doses of the hormone increased fertility and hatchability, at least during the winter. No influence on sexual activity, egg weight, loss of weight during incubation, or the development of the chicks was noted.

The effects of testosterone and testosterone propionate on adult male rats (compared with those on female rats), V. Korenchevsky, M. Dennison, and K. Hall (*Biochem. Jour., 31 (1937), No. 8, pp. 1434–1437*).—The administration of testosterone and testosterone propionate to rats caused hypertrophy of the secondary sexual organs, but the amount in females was greater than in males. The bisexual property of these hormones in normal animals was clearly demonstrated.

FIELD CROPS

[**Research with field crops in the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1937, pp. 1–7, 8–10, 14, 15, 19, 20, 21, 22*).—Brief reports of progress and accomplishments are reported from breeding work with corn, sweet corn, oats, barley, grain sorghum, cotton, sugarcane, sugar beets, tobacco for high nicotine, soybeans, peanuts, and crotolaria; tests of productive corn hybrids resistant to stalk and ear rots on highly fertile soils; drought endurance of sorghums; a method of expediting the increase of seed of improved strains of alfalfa; regional cotton variety experiments; advantages of one-variety cotton communities; varieties and selections of sweetpotatoes for starch manufacturing; a survey in Guatemala and Mexico for teosinte; effects of light of various wave lengths on the growth of corn seedlings, of storage on the malting quality of barley, and length of day on rice; the amount of natural cross-pollination taking place in fiber flax; malting studies with barley; grazing experiments with winter wheat; treatment of flaxseed with disinfectants before sowing to destroy soil-borne disease organisms; use of various organic manures applied in deep furrows for controlling cotton root rot under irrigation; use of a harmless green dye to control turf diseases; resistance to powdery mildew in red clover; cultural (including planting) tests with cotton, seed flax, corn, and sweetclover; correlation between fall-cutting practices and bud development, winter survival, and yield of alfalfa; conservation of soil moisture by crops and fallow under dry land conditions and in relation to wheat production; fertilizer experiments with cotton, rice, and tobacco; effect of surface applications of lime and fertilizers on soil reaction and available phosphate at different depths in permanent pastures; lespedeza v. alfalfa on limed and fertilized soil: control of bindweed and other weeds; and suscep-

tibility of different crop plants to injury by the herbicide sodium chlorate. Many studies were in cooperation with State experiment stations.

[Agronomic studies in Colorado] (*Colorado Sta. Rpt. 1937, pp. 16, 17, 22, 23, 24, 25, 34, 35, 47–50, 55–57*).—Brief reports of progress (E. S. R., 76, p. 468) are given from breeding work with corn, potatoes, and sorghum; studies of the hydrocyanic acid content in Sudan grass; starch and mineral content of Colorado potatoes; variety tests with barley and potatoes; cultural and fertilizer trials with potatoes; artificial revegetation of depleted range and abandoned crop lands; management of native hay meadows in high mountain parks; range resource surveys in Washington County; and experiments on control of bindweed and other perennial weeds by cultivation and chemicals, supplemented by microscopic and analytical studies.

The work of the agronomy department of the State experiment station, W. E. Stokes (*Citrus Indus., 18 (1937), No. 9, pp. 5, 20, 21*).—A review of the work and accomplishments at the Florida Experiment Station.

[Field crops research in Georgia] (*Georgia Sta. Rpt. 1937, pp. 9–14, 15, 17–21, 33–36, 41, 45, 60, 63, 64, figs. 2*).—Experimentation (E. S. R., 76, p. 323) at the station and Mountain Substation, reported on briefly, comprised breeding work with wheat, oats, cotton, soybeans, and peanuts; variety tests with cotton, sorgo, and potatoes; one-variety community work with cotton; fertilizer experiments with peanuts and with cotton, including nutrition of the plant, sources of nitrogen and of calcium phosphate, and comparison of formulas; planting tests with potatoes; and pasture investigations, including nutritional, weed control, soil temperature and moisture studies, and tests of pasture mixtures. Several lines of work proceeded in cooperation with the U. S. Department of Agriculture and the Georgia Coastal Plain Station.

[Field crops experiments, 1915–36, on Indiana Station experiment fields and farms], A. T. Wiancko et al. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–36, pp. 3, 4; Huntington Field, 1919–36, pp. 3, 4; Jennings Co. Field, 1921–36, pp. 7, 8; Pinney-Purdue Field, 1920–36, pp. 6, 8; Sand Field, 1924–36, pp. 5–8; Soils and Crops Farm, 1915–36, pp. 1–6, 9–24, figs. 2*).—Results covering various periods are again reported (E. S. R., 74, p. 189) from variety tests with corn, wheat, oats, barley, rye, alfalfa, and soybeans; crop rotations; effect of certain crops on yields of crops that follow; an experiment on the place in the rotation to apply manure; effects of methods of disposing of cornstalks on yields of corn and oats; a comparison of grain v. livestock farming; clover v. timothy for hay production; fertilizer experiments with corn, wheat, alfalfa, and pasture; fertilizer placement for corn; corn variety and rate of planting tests on muck; cultural (including planting) tests with corn and with soybeans for hay and seed; comparison of corn and sunflowers for silage; and reinoculation of soybeans.

A digest of some world pasture research literature (exclusive of the continental United States and Canada), A. J. Pieters (*U. S. Dept. Agr., Bur. Plant Indus., 1937, pp. [421]*).—The present digest, presented to serve as a cross section of foreign pasture research and the outstanding results, embraces 1,282 titles grouped geographically and an index. A similar digest of pasture research literature in the continental United States and Canada has been noted earlier (E. S. R., 77, p. 326).

Preliminary report of a study on methods used in botanical analyses of pasture swards, F. W. Tinney, O. S. Aamodt, and H. L. Ahlgren (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 835–840, fig. 1*).—The string, vertical, and inclined point-quadrat, specific frequency, percentage frequency, and percentage area methods for making botanical analyses of pastures were tested in 1936

for accuracy and practicability by the Wisconsin Experiment Station cooperating with the U. S. D. A. Bureau of Plant Industry. Each method was applied in May and October at 30 randomized stations on two 4.5 acre fields.

The methods, when used on pasture swards in the Great Lakes region, provided data differing markedly in type of information, accuracy, and labor involved. Some methods duplicated the information obtained by others. On the basis of relative F values, labor, and accomplishment, the use of the specific frequency and percentage frequency methods when used with a grid are not encouraged, and the information which either provides, if desired, can be gained by one of the two point-quadrat methods or the string method. The two point-quadrat methods showed the greatest merits for a rapid and reliable means of determining the composition of a pasture, and also an indication of productivity. The inclined point-quadrat method covers the greater area per reading and consequently increases the accuracy, and is more easily used in tall vegetation.

Barley in Iowa: Factors influencing economy in production, L. C. Burnett and C. S. Reddy (*Iowa Sta. Bul. 367* (*1937*), *pp. 269–291, figs. 8*).—The general status of the barley crop in Iowa is reviewed, and data from planting, fertilizer, and treatment tests with nine varieties are included, with comments on their relative susceptibility to spot blotch, head blight, and stripe, caused by *Helminthosporium*, scab, bacterial blight, and loose smut.

Barley yields per acre in Iowa are higher than those for oats, although oats were grown on 6,000,000 acres, 1925–34, v. 460,000 in barley. Smooth-awned varieties, introduced into Iowa in 1927, have almost entirely replaced those with barbed awns. Premiums paid by the industries for high grades of certain barleys have stimulated considerable interest in the crop.

Acre yields of Trebi, Wisconsin 38, Glabron, Spartan, and Velvet were so nearly equal that varietal choice must be based upon characters other than yield. O. A. C. 21, Colsess, and Manchuria, and, in northern Iowa, Minsturdi, also appeared to be poorly adapted. The marked influence of planting date upon the behavior of the crop, particularly acre yields, was demonstrated both at Ames and in northern Iowa. No other cultural practice studied gave as great an increase as did early planting, which is especially recommended. Ripening dates, plant heights, bushel weights, and acre yields were modified slightly by fertility, but lodging was increased by each fertilizer treatment. The lack of tolerance of all varieties for nitrate was noteworthy; it increased lodging and depressed yields even when in a complete fertilizer. Indications were that some varieties are more sensitive than others to high and low fertility levels; that Trebi was the only barley studied that profited from phosphorus in amounts exceeding those already in the experimental soil; and that all barleys are sensitive to nitrogen, particularly Glabron, Velvet, and Minsturdi.

Seed treated with ethyl mercury chloride gave yield increases compared with nontreated seed at Ames and in northern Iowa when Trebi, Spartan, Wisconsin 38, Minsturdi, and Colsess were sown at the normal planting season, but treatment did not increase yields of Velvet, Glabron, or Manchuria. With one exception, yield increases for the varieties benefited usually were largest for the early planting and diminished as planting was delayed. No variety gave increases from treatment in the very late sowings. Except with Wisconsin 38 and Minsturdi, the economic increases from seed treatment were limited to the early plantings.

Hybrid corn in Iowa, A. A. Bryan and R. W. Jugenheimer (*Iowa Sta. Bul. 366* (*1937*), *pp. 225–266, figs. 31*).—Methods followed in corn improvement by the station in cooperation with the U. S. D. A. Bureau of Plant Industry are

outlined, and the inbred lines and hybrids which have been developed and released for commercial production are described. See also a previous note (E. S. R., 77, p. 326).

Decomposition of Crotalaria juncea under field conditions, B. N. and S. N. Singh (*Jour. Amer. Soc. Agron., 29 (1937), No. 11, pp. 885–889*).—The decomposition of various parts of *C. juncea* (E. S. R., 75, p. 477) under field conditions was measured in terms of weighable organic matter left undecomposed in the soil at successive intervals and the available and total nitrogen added to the soil.

Leaves were decomposed most rapidly, with roots and stems next in order. Most of the leaf was decomposed within 4 weeks, complete decomposition requiring not more than 6 weeks. On the other hand, after 8 weeks 37.5 percent of the stems and 19.6 percent of the roots remained apparently unattacked by soil micro-organisms. The leaves contributed most to the soil in both available and total nitrogen, the maximum being attained in a 6-in. layer after 4 weeks of burial, with a subsequent decrease thereafter in nitrogen. Effects of leaching were apparent especially in the case of the leaves. Nitrogen seemed to penetrate deeply into the soil at a rapid rate.

Anthesis of millet, Setaria italica (L.) Beauv., C. M. Heh, T. F. Mei, and S. S. Yang (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 845–853, figs. 2*).—Observations at the University of Nanking of heads of 18 pure varieties of millet during 1934 and 1935 showed that flowering commences on the fifth day after spike emergence and the peak on the ninth day. An average of 12 days, ranging from 8 to 16 days, is required to complete flowering. While daily blooming occurs from 8 p. m. to 10 a. m., one maximum period in which the first rush is from 10 to 12 p. m. and a second period from 8 to 10 a. m. were observed. Flower opening practically ceases by 2 p. m. Flowering begins from the apex and progresses downward. A single flower may require about 80 min. for the various phases of blooming and may remain open completely for 30 min. Anthesis is favored by a relatively low temperature and high humidity. See also earlier notes by Ayyangar et al. and Li et al. (E. S. R., 70, p. 469; 74, p. 480).

Factors influencing seed set in oat crossing, F. A. Coffman (*Jour. Heredity, 28 (1937), No. 9, pp. 297–303, pl. 1, figs. 3*).—The author's method for crossing oats is described, and data are presented on the effects of temperature, time of day, and other factors upon the seed set after artificial pollination of oats flowers. Conditions favorable to oats crossing include greenhouse rather than field, from 2 to 5 p. m., rather cool days, and low evaporation. Success in pollination evidently is not related to wind velocities from 2 to 5 miles per hour, although high winds may damage the bagged panicles or blow pollen.

Cultural and storage research with potatoes during 1936, E. V. Hardenburg (*Amer. Potato Jour., 14 (1937), No. 7, pp. 211–215*).—Thirteen studies are reviewed.

Testing seedling potato stocks for specific horticultural factors under controlled conditions, H. O. Werner (*Amer. Potato Jour., 14 (1937), No. 10, pp. 325–331*).—Horticultural factors that appear worthy of consideration and for which suggestions concerning type of testing are given in this contribution from the Nebraska Experiment Station include metabolic efficiency or tuberization ability, morphological response, susceptibility to secondary growth, resistance to drought and heat, resistance to tipburn, frost resistance, root habit of varieties, tuber cracking at harvest time, wound healing capacity, storage response, length of rest period, and cooking quality.

Suberization of potato sets in its relation to stand and yield, P. M. Lombard (*Amer. Potato Jour., 14 (1937), No. 10, pp. 311–318*).—Results secured by the U. S. D. A. Bureau of Plant Industry working at Presque Isle, Maine, and cooperating with several State experiment stations, 1924–29, indicated that seed potatoes can be cut from 10 to 30 days in advance of planting without significantly decreasing the yield, providing cut seed is properly suberized and cared for during storage between cutting and planting.

The effect of the sun-greening of potato seed tubers on weight losses in storage and on subsequent field performance, K. C. Westover (*Amer. Potato Jour., 14 (1937), No. 11, pp. 341–350; abs. in Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 436*).—Under conditions at the West Virginia Experiment Station conducive to rapid greening, sun-greening of the potato (White Rural) seed tuber in the fall, when sprouts are not normally formed, had no marked effect on loss of weight from tubers during greening or subsequent storage periods, but under conditions favoring slow chlorophyll development greened tubers lost more weight. There was little evidence to show that sun-greening had any effect on the time of plant emergence or its later development, and the results did not indicate any practical value.

The effect of high storage temperature upon fall-grown seed Irish potatoes, J. C. Miller, W. D. Kimbrough, and J. G. Richard (*Amer. Potato Jour., 14 (1937), No. 11, pp. 362–364*).—Yields of Louisiana fall-grown Triumph potatoes planted 30, 60, and 100 days after harvest by the Louisiana Experiment Station varied directly with the length of time between harvesting and planting, all producing less than western dry land certified seed having a 150-day interval. Fall-grown seed kept at high temperatures (60°–75° F.) from harvest to planting outyielded seed kept in unheated common storage, both lots making considerably less than western dry land certified seed.

A preliminary report on the effects of commercial fertilizers on potatoes in Colorado, C. H. Metzger (*Amer. Potato Jour., 14 (1937), No. 12, pp. 382–394*).—Progress is reported from fertilizer tests comparing in four localities treble superphosphate, ammoniated phosphate, ammonium sulfate, and potassium chloride with 4–12–4 complete fertilizer in growing Russet Burbank, Perfect, Peachblow, and Rural New Yorker No. 2 potatoes. Data are given on yield, grade, starch and dry matter, shape and appearance, rate of tuber development, tuber set, vine development, and tuber: vine ratio.

Yield and quality of sugar beets from various rotations at the Scotts Bluff (Nebr.) Field Station, 1930–35, S. B. Nuckols (*U. S. Dept. Agr. Circ. 444 (1937), pp. 15*).—Average acre yields of sugar beets, sucrose percentage, purity, and sugar production per acre are reported from results secured, 1930–35, in a series of 29 crop rotations, including sugar beets. Comparisons are made of short, medium, and long rotations and of rotations with and without legume crops, and the effects of using manure with crop rotations are discussed. See also earlier reports (E. S. R., 75, p. 617) on this work.

Indications were that while the use of manures and legumes might have a slightly depressing influence on the percentage of sucrose in the beet, their rational use is necessary for the production of satisfactory crops of sugar beets. The rotations did not indicate that corn, spring wheat, oats, or potatoes had enough influence upon the sucrose percentage in beets or indicated available sugar produced per acre to cause the selection of any one of them to precede sugar beets; the selection evidently should be made upon the value of the crop used and not upon its probable effect on sugar beet quality.

Nitrogenous fertilizers for growing tobacco, A. B. Beaumont and M. E. Snell (*Massachusetts Sta. Bul. 346 (1937), pp. 15, figs. 2*).—Experiments, 1927–

35, on the use of nitrogenous fertilizers in growing Havana Seed tobacco, a cigar-wrapper type (E. S. R., 70, p. 180), dealt with the quantity and form of nitrogen applied, the ratio of organic to inorganic nitrogen, and the method of applying fertilizer.

When nitrogen from several sources was applied at rates of 61.8, 123.5, 164.7, and 205.9 lb. per acre, the highest average yield of tobacco was obtained with 205.9 lb., but the highest grade index and crop index (yield × grade index) resulted from the use of 164.7 lb. With half the nitrogen in the fertilizer supplied by sodium nitrate, ammonium sulfate, calcium cyanamide, or urea, and the remainder from cottonseed meal, sodium nitrate gave best results as measured by crop index, yet all carriers produced high yields. The grade index of leaf grown with ammonium sulfate was lowest. When the ratio of organic nitrogen (cottonseed meal) to inorganic nitrogen (equal parts from sodium nitrate and ammonium sulfate) varied from 1:7 to 1:1, good yields and good quality of tobacco came from all treatments, with slight differences in results. A cover crop of oats sown each year, it is suggested, might have been a contributing factor. Conclusions were that a comparatively high rate of application of fertilizer nitrogen is necessary for growing Havana Seed tobacco of high yield and quality, and that no more than one-half and probably as little as one-fourth of the nitrogen need come from organic carriers such as cottonseed meal.

The experiments also showed that the amount and distribution of rainfall during the growing season of tobacco are important factors influencing both yield and grade of tobacco; that for best results a comparatively high level of nitrates must be maintained in the soil during the period of most rapid vegetative growth; and that the form of fertilizer nitrogen used bears little or no relation to brown root rot of tobacco.

Row application of fertilizer in bands near the plants at time of setting was favored during the first 2 yr. of an experiment, 1932–35, but considering the study as a whole, broadcast application gave the best results. However, small amounts of fertilizer applied near the plants were proportionately more effective than large quantities broadcasted.

Tobacco fertilizer recommendations for 1938 (*North Carolina Sta. Agron. Inform. Circ. 108 (1937), pp. [5]*).—Formulas, rates per acre, and sources of nutrients, formulated by a committee of agronomists, are recommended for fertilizers for flue-cured, sun-cured, and shipping tobacco, and for plant beds on tobacco soils in North Carolina, South Carolina, Virginia, and Georgia.

Nitrogen: The major cause in the production of spotted wheat fields, P. L. Gainey, M. C. Sewell, and H. E. Myers (*Kansas Sta. Tech. Bul. 43 (1937), pp. 58, figs. 5*).—On well-defined spots, usually from 2 to 3 ft. in diameter, often observed in small-grain fields in Kansas, the growing grain is darker green and apparently more vigorous than in surrounding areas. To determine the possible relation of such spots to the nitrogen metabolism of the wheat plants, plant material and soils were collected from typical spots and immediately adjacent areas (a total of 172 samples from 38 counties), the plant material analyzed, and the soils subjected to bacteriological examination. Similar studies were made on the wheat and soils from spots produced experimentally. See also previous reports (E. S. R., 64, p. 32; 68, p. 165).

Wheat grown on the spots, compared with adjacent areas, made greater growth, contained much higher percentage nitrogen and total quantity of nitrogen, was equally resistant to lodging, and produced very much more grain which was significantly higher in protein content than grain from the field at large.

The soil from the spots averaged higher in nitrogen and much higher in nitrate content than adjacent soils and, under laboratory conditions, could accumulate nitrate nitrogen much more rapidly. No deficiency was evident in the nitrifying flora of soil adjacent to the spots, and the ability of soil from spots to accumulate nitrate nitrogen more rapidly apparently was associated with the quantity and quality of the excess nitrogen contained therein. Typical spotting under Kansas conditions is held due to deposits of urine by grazing animals, and the nitrogen in the urine is the factor responsible for the development of the spot.

In fields where spots occur naturally, experimental spots, apparently identical in every aspect, could be produced by surface application of all forms of nitrogen thus far tested, provided the time and quantity of application were chosen judiciously. Some fields would not respond to such treatment.

Depending upon the time and quantity of nitrogen applied, experimental surface application of nitrogen to wheat on soils subject to spotting might result in no appreciable effect with light summer or fall applications, or increased yield and decreased protein content with medium fall and light to medium early spring applications, or increased yield and increased protein content with medium to heavy fall and early spring applications, or decreased yield and increased protein content with very heavy fall and early spring applications, or marked increase in protein content and slight effect upon yield with light to medium late spring applications.

Farm storage of wheat as a factor in quality, C. O. Swanson (*Northwest. Miller and Amer. Baker, 14 (1937), No. 12, pp. 35, 56*).—The behavior of wheat in storage is described, largely from research at the Kansas Experiment Station.

Milling and baking quality of wheat produced in years of severe rust in North Dakota, R. H. Harris and T. Sanderson (*North Dakota Sta. Circ. 61 (1937), pp. 15, figs. 2*).—Large variations in grade, test weight, and flour yield were evident among the 89 samples of hard red spring wheat grown in different counties of North Dakota in 1937. Protein content differed from sample to sample of wheat, and this variability was reflected in corresponding flour samples. With these flours, the standard baking method yielded good loaves, satisfactory in size, color, and texture; and a method which included specified quantities of malt, ammonium phosphate, and potassium bromate, in addition to the standard method ingredients, markedly increased loaf volume and improved color of loaf crumb. The excellent baking results showed high quality in the current crop of hard red spring wheat.

Correlations calculated between different characters showed the importance of test weight of flour yield and of wheat protein to flour protein, which in turn was highly related to loaf volume. Color of loaf crumb tended to increase with test weight. Comparison between results for the 1937 crop and for the 1916 and 1935 crops revealed the lowest flour yield in 1937, but low test wheat in 1937 produced larger loaves of better color than in 1916 or 1935. Thatcher produced the most satisfactory results of any variety tested, but samples were too few for conclusive results. The western section of North Dakota produced wheat of higher average test weight and flour yield than the eastern section, but no important differences in milling and baking quality of wheats were noted between the sections.

Germination of seed of farm crops in Colorado after storage for various periods of years, D. W. Robertson and A. M. Lute (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 822–834, figs. 2*).—Further germination tests (E. S. R., 69, p. 363) were made at the Colorado Experiment Station on the seeds of various farm crops adapted to Colorado conditions stored in a dry, unheated room for from 1 to 15 yr.

Germination percentages of wheat, oats, and barley declined slowly for the first 10-yr. period with a sharp break in germination between the tenth and twelfth years. There were indications of different reactions to storage between 6-row hulled, 2-row hulled, and 6-row hull-less barleys. Rosen rye and Wisconsin Black soybeans did not maintain their viability to the same degree as wheat, oats, and barley, yet the trend was the same. The break occurred between the sixth and eighth years and dropped off very rapidly afterward. Black Amber sorgo maintained an excellent germination percentage after storage for 10 yr. Yellow dent corn germinated well for the first 6 yr. and dropped off rapidly between the ninth and tenth years and again between the twelfth and thirteenth years. Germination percentages of Rosen rye, Wisconsin Black soybeans, and corn were low at the end of the test period.

[**Seed and inoculant investigations**] (*New York State Sta. Rpt. 1937, pp. 17, 18, 88–91, 92, 93*).—Brief reports are rendered on the progress of and methods for (E. S. R., 76, p. 330) the inspection of commercial legume inoculants, and on seed work concerned with the quality of field crop, vegetable, and flower seed as shown by official tests; a drill survey of oats; quality of thresher-run samples of oats and barley; viability of Chewing fescue; and hard seeds in peas and beans.

Season's work in control field reveals amazing results, M. T. MUNN (*Farm Res. [New York State Sta.], 4 (1938), No. 2, p. 8*).—Field tests with 131 samples of oats, 56 of barley, and 200 lots of corn, secured from stocks sold in New York State for seed, revealed in addition to excellent stocks many lots untrue to name, with meaningless names, or unadapted. Farmers are advised to be certain of the origin and varietal purity of seed stocks bought.

North Dakota weeds, O. A. STEVENS (*N. Dak. Agr. Col. Ext. Circ. 156 (1937), pp. 60, figs. 59*).—A revision of station Bulletin 243 (E. S. R., 65, p. 338).

The effect of water-soluble and total nitrogen and of drying on the rate of nitrification of some common Florida weeds, M. R. BEDSOLE, JR. (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 815–821, fig. 1*).—A number of weeds common to Florida were analyzed at the Florida Experiment Station for water-soluble and total nitrogen, and the rate of nitrification was determined in both green and dry stages in Norfolk fine sand.

Boerhaavia, coffee weed, carelessweed, and crabgrass contained a comparatively high percentage of water-soluble and total nitrogen, and appeared suitable for cover purposes where a rapidly nitrifying material is needed. Wire grass, peppergrass, sandbur, Spanish-needle, and ragweed were low in nitrogen and slow to yield available nitrates.

The water-soluble nitrogen content appeared to be the major factor involved in nitrification of green and dried plants, and was followed in order by total nitrogen and degree of hydration or moisture. Nitrification of plants containing above 1.7 percent nitrogen and 0.5 percent water-soluble nitrogen was affected only slightly by drying, while plants containing less than 0.5 percent water-soluble nitrogen showed a decrease in nitrification upon drying. Favorable nitrate accumulation occurred if the water-soluble nitrogen was 0.5 percent or above. Plants containing above 1.7 percent total nitrogen but less than 0.33 percent water-soluble nitrogen had a slow accumulation of nitrate nitrogen in the soil.

The acid-arsenical method in weed control, A. S. CRAFTS (*Jour. Amer. Soc. Agron., 29 (1937), No. 11, pp. 934–943, fig. 1*).—An attempt is made to clarify the status of the acid-arsenical treatment for killing deep-rooted perennial weeds (E. S. R., 69, p. 520) by accurately describing conditions and technic necessary for optimum results, pointing out limiting factors, and presenting

additional data indicating improvements. Although practical in the semiarid West, general use of the method in more humid regions, according to the author, can only lead to disappointment if its limitations are not recognized fully.

HORTICULTURE

[**Horticultural investigations conducted by the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1937, pp. 7, 8, 12, 13, 14, 15, 16, 17, 18, 19*).—Included are reports on the following studies: Growing and harvesting of pyrethrum, improvement of *Tephrosia* (*Cracca*) *virginiana* as a source of insecticidal material, testing of various species for insecticidal properties, breeding of hops for mildew resistance, asexual propagation of the apple, effect of boron and zinc on the apple, effect of soil moisture on the growth rate of Anjou pears, nematode-resistant rootstocks for vinifera grapes, preservation of date pollen in cold storage, cultural and fertilizer studies with pecans, effect of ethylene gas in loosening pecan shucks, control of pecan scab, breeding and pollination of almonds, wind distribution of Persian walnut pollen, causes of pocketing of tomato fruits, breeding of disease-resistant tomatoes, bacterial wilt-resistant cucumbers, and powdery mildew-resistant muskmelons, designing of a ventilated container for peaches, transportation of citrus fruits, storage of citrus fruit after shipment, precooling and transportation of grapes, harvesting and transportation of cantaloups, a new process of growing mushrooms, and the testing of rubber-producing plants, such as *Oenothera biennis* and *Hevea*.

[**Horticultural studies conducted by the Colorado Station**] (*Colorado Sta. Rpt. 1937, pp. 35–38*).—Included are brief reports on strawberry varieties and cultural tests with strawberries and raspberries, testing of new tree fruits, rootstocks for sour cherries, soil management of sour cherry orchards, effects of steam sterilization of soil on availability of plant nutrients for the carnation, breeding of Sweet Spanish-type onions, selection of adapted strains of onions, fertilizer and planting methods for onions, date of planting onions, breeding of head lettuce, general variety trials with vegetables, and selection studies of pyrethrum to increase the pyrethrin content.

[**Horticultural studies by the Georgia Station**] (*Georgia Sta. Rpt. 1937, pp. 45, 46, 52–59, 61–63, figs. 6*).—Brief reports are presented on studies of the carbohydrates in muscadine grape cuttings from May through November; the nonvolatile acids in muscadine grapes; nature of the pigment in the Hunt grape; measurements of the surface area in peach fruits; improvement of the Perfection pimiento pepper; hybridization of cabbage × collards; tomato varieties; new pea, cucumber, and bean stocks obtained from the U. S. D. A. Regional Vegetable Breeding Laboratory at Charleston, S. C.; electricity v. manure as heat for hotbeds; propagation of the muscadine grape; rootstocks for northern or bunch grapes; cover crops for peach orchards to reduce erosion; response of peach varieties to temperature; manufacture of wine from muscadine grape varieties; and at the Mountain Substation the protection of blossoming peach trees by cloth covering and the testing of fruit and vegetable varieties.

[**Vegetable production**] (*U. S. Dept. Agr. Leaflets 133 (1937), pp. 6, figs. 4; 136, pp. 5, figs. 3; 137, pp. 4; 138, pp. 5; figs. 2; 139, pp. 4; 140, pp. 4; 141, pp. 8, figs. 5; 142, pp. 4; 143, pp. 4, fig. 1*).—The following pamphlets present brief cultural notes and comments: Nos. 133, Production of Chicory and Endive, by W. R. Beattie; 136, Production of Parsley, 137, Rhubarb Forcing, 138, Production of Garlic, and 139, Production of Roselle, all by J. H. Beattie; 140,

Production of Peppers, by J. H. Beattie and S. P. Doolittle; 141, Production of Pumpkins and Squashes, by R. C. Thompson; 142, Production of Turnips and Rutabagas, by W. R. Beattie; and 143, Production of Kale, by R. C. Thompson.

Notes on some of the newer vegetables, A. T. Erwin and E. S. Haber (*Iowa Sta. Bul. 363 (1937), pp. 129–149*).—Data are presented on the yields and characteristics of varieties of beans, carrots, beets, tomatoes, sweet corn, cucumbers, potatoes, melons, squashes, and rhubarb.

[Vegetable crop studies by the New York State Station] (*New York State Sta. Rpt. 1937, pp. 84 85–87, 96–103*).—Included are reports of progress of studies on the breeding of mosaic-resistant summer squashes; species relationships in cucurbits; improvement of hops by breeding and selection; testing of hop varieties from various sources; the proper time for gathering hops; band v. broadcast application of fertilizers; residual effects of fertilizers on peas; changes in granular and powdered fertilizers in the soil; organic v. mineral fertilizers; effects of fertilizers on the quality of cannery corn; cultural and fertilizer tests with spinach; harmful effects of beets on the succeeding sweet corn crop; breeding of tomatoes, squash, and muskmelons; hybrid sweet corn varieties; and varieties of peas and tomatoes.

The composition of the aerial parts of the summer squash (Cucurbita pepo) at different stages of development, C. W. Culpepper (*Amer. Jour. Bot., 24 (1937), No. 9, pp. 565–573*).—Analyses of White Pattapan squash plants grown at the U. S. D. A. Arlington Farm, Va., in 1928 and collected at four stages of development showed, on the whole, that the vegetative parts were characterized by a low content of sugars, acids, tannins, and soluble organic constituents. The leaf blades were rather high in insoluble constituents, chiefly nitrogenous substances. Nitrate nitrogen accumulated in the petiole with increasing age when an ample supply was present in the soil. Total sugars were lowest in the leaf blade and highest in the fruit, with intermediate values for the petiole and stem. Moisture in the fruit increased to the ninth day and then declined to the fortieth day.

The results of a tomato plant growing experiment, C. B. Sayre (*Farm Res. [New York State Sta.], 4 (1938), No. 2, pp. 2, 7*).—In this second report (E. S. R., 77, p. 784), the author presents yield data for a single season, showing that with a common source of seed, moderately hardened younger plants produced the largest early and total crops. Comparisons of locally produced plants with those grown in southern States from the same lot of seed favored the locally grown stock.

"Redcap," a new early tomato (*Farm Res. [New York State Sta.], 4 (1938), No. 2, p. 7*).—Brief comments are presented on a recently named tomato developed by the station.

Fertilizer experiments with greenhouse tomatoes, J. W. Lloyd and B. L. Weaver (*Illinois Sta. Bul. 438 (1937), pp. 273–288*).—Urbana Forcing and Lloyd Forcing tomatoes grown both as fall and spring crops in ground beds uniformly supplied with rotted manure and superphosphate but differently treated with respect to potash and nitrogen showed little response to either nitrogen or potash and, in fact, in some instances these materials were evidently harmful. In all cases the spring crops were much larger than the autumn, so much so that the commercial growers are justified in their practice of growing only spring crops. With the spring crops, the only significant results were negative, deferred applications of potash being particularly injurious. Apparently, where ample supplies of stable manures are available, tomatoes may be grown on ground beds of the kind of soil used in the experiments without any kind of supplemental commercial fertilizer.

[Pomological studies by the New York State Station] (*New York State Sta. Rpt. 1937, pp. 32, 33, 66–84, 85*).—Investigations briefly reviewed include spreading and wetting properties of various insecticides; removal of spray residues from apples and cherries; effect of fertilizer treatments in the lysimeter and orchard on the growth of fruit trees and the composition of their leaves; soil management studies in apple orchards in the Hudson River Valley; varietal response of orchard- and greenhouse-grown apple trees to fertilizer treatment; soil reaction requirements of the blueberry; soybeans as snow-holding cover crops; breeding of new raspberries and apples; fertilizers, rootstocks, and pruning for grapes; fertilizer trials with apples in the Hudson River Valley; introduction of standardized dwarfing apple rootstocks; propagation of rootstocks; testing of clonal stocks in the orchard; development of hardy cherry stocks; use of peat moss in seedling production and as an auxiliary substance for planting trees; relation of seedling size to that of the mature tree; effect of winter injury to nursery stock and its subsequent development; relation of the developmental morphology findings to fruit thinning; artificial culture of fruit tree embryos; seed attachment and carpel symmetry; growth of the embryo as affected by ringing and defoliation; peach embryo abortion as related to chemical composition and the season of ripening; and testing of plum and cherry stocks.

A rapid method for determining soluble nitrogen and phosphate phosphorus in woody tissue, C. S. Waltman (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 130–132*).—Studies by the Kentucky Experiment Station upon different portions of the shoots of Winesap apples and Elberta peaches showed the percentages of nitrogen to be more variable than those of phosphorus in woody tissues of any age, and the phosphorus content of the wood varied less than the nitrogen from the base to the tip of current-season shoots. Tests upon leaves showed no correlation between the soluble nitrogen content and the conditions under which the trees were growing, leading to the suggestion that leaves are not desirable for analytical purposes.

Regeneration in various types of apple wood, V. T. Stoutemyer (*Iowa Sta. Res. Bul. 220 (1937), pp. 305–352, figs. 48*).—As a result of propagation studies supplemented by histological examinations of various tissues of the apple tree, the author demonstrated the existence of two distinct growth phases characterized as juvenile and mature and related closely to the ease of regeneration of roots on stems. The juvenile phase was recognized by the thinness of the leaves, the small amount of pubescence, and the abundant production of anthocyanin in the shoots. In some species, the shape of the leaf changed with maturity from an entire to a lobed form. Shoots with juvenile characteristics were produced from the roots of older trees, and stem cuttings from such shoots rooted readily. Juvenile shoots were produced from adventitious buds on roots and possibly from adventitious buds on limbs of mature trees. Stem cuttings of wood of the mature phase were very difficult to root without special treatments.

Water sprouts were found to develop from latent rather than adventitious buds, and the only adventitious buds produced on stems occurred as sphaeroplasts which are described as small wood inclusions found in the bark of various species, including the pear and the apple. On certain varieties, sphaeroplasts never occurred and were found most frequently on Iowa Blush, King David, Hutchins Red, Northwestern Greening, Virginia Crab, and on certain Jonathan × Delicious seedlings. Sphaeroplasts possess a true cambium and continue growth for several years, forming annual rings. Adventitious buds produced by the roots arose from parenchyma in the secondary cortex.

The change from juvenile to mature phase was not related to the beginning of secondary growth in the plant, to the loss of primary structures, or to the stage of organization of internal tissues in the stem. The expression of growth phases is believed dependent upon certain biochemical factors not clearly understood.

Influence of respiration on the daily rate of photosynthesis of entire apple trees, A. J. HEINICKE and N. F. CHILDERS (*Amer. Soc. Hort. Sci. Proc., 33* (*1936*), *pp. 142–144*).—Following the same methods outlined in an earlier paper (E. S. R., 77, p. 483), determinations were made during the season of 1936 of the apparent respiration of a 9-year-old McIntosh tree growing in alfalfa sod in the Cornell University orchards. Fluctuations in respiration during the 180 nights could not all be accounted for by temperature, and the small amount of radiation during twilight and dawn. In June, when growth was at a maximum, the respiration rate was much greater than later. By covering the cage with dark paper it was found that, at the same temperature, respiration was greater during day than night. High temperature actually reduced photosynthetic activity markedly, and the author points out that in the apple the most favorable conditions for carbohydrate accumulation were in the latter part of the year. A high rate of respiration during the preceding night may influence the apparent photosynthesis during the first part of the succeeding day.

Root distribution of a Baldwin apple tree in a heavy soil, D. BOYNTON and E. F. SAVAGE (*Amer. Soc. Hort. Sci. Proc., 33* (*1936*), *pp. 164–168*).—The root system of a 25-year-old Baldwin apple tree, growing in the center of a square of four McIntosh trees 40 ft. apart, was examined in the summer of 1936 by Cornell University. The soil was heavy throughout the profile and not sufficiently well-drained to produce best yields. The orchard was in sod. There was noted a wide range of root concentration at any depth and distance from the trunk, but there was a definite tendency for the density of small roots to decrease both with distance and depth. The greatest density of absorbing roots was in the top 3 ft., within 8 ft. of the trunk.

Soil moisture and fruit growth in an orchard situated on shallow soil in the Hudson Valley, N. Y., 1936, D. BOYNTON (*Amer. Soc. Hort. Sci. Proc., 33* (*1936*), *pp. 169–172, fig. 1*).—Checking fruit circumference measurements with soil moisture readings, it was observed in this study conducted by Cornell University in a 12-year-old McIntosh orchard located on Cossayuna gravelly loam that even in a season of normal precipitation the lack of rainfall for a period as brief as 2 weeks may cause a reduction in fruit growth in trees located on soil only 2 ft. deep. There was a drop in soil moisture from about 35 percent of available capacity to the wilting percentage in 13 days. On an adjacent plat, where the soil approached 4 ft. in depth and the permanent wilting percentage was never reached, there was no slowing down in fruit development.

Effect of cultural treatments on the growth and nitrogen content of apple shoots and spurs, J. T. SULLIVAN and C. E. BAKER (*Amer. Soc. Hort. Sci. Proc., 33* (*1936*), *pp. 149–154, fig. 1*).—Grimes Golden apple trees completing their fourteenth growing season in 1936 and given differential cultural treatment for 12 yr., as follows, (1) cultivation with early-sown cover of rye or wheat, (2) permanent bluegrass fertilized with sulfate of ammonia, and (3) mixed legume sod, chiefly alfalfa, were studied by the Indiana Experiment Station with respect to growth, production, and nitrogen content of shoots and spurs. Up to the time of bearing, trees in cultivation with cover crops without organic nitrogen made the greatest growth and contained more nitrogen than did the trees in bluegrass plus nitrogen fertilizers. However, the trees in bluegrass eventually passed the cultivated trees in growth and nitrogen content. Spur growth

was not always correlated with terminal growth, for in 1933 and 1936 cultivated trees low in nitrogen and always producing less terminal growth produced at times a high dry weight of spur growth. The legume plats were intermediate to the other two in all characteristics.

The effect of pruning and nitrating upon apple tree performance, M. J. Dorsey (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 138*).—Records taken by the Illinois Experiment Station over a 7-yr. period on the yield, size, and color of fruit produced by Ben Davis trees subjected to differential pruning, fertilizing, and mulching practices showed no significant influences on the biennial fruiting habit when fruit thinning was omitted.

A summary of some tests with different kinds of commercial nitrogenous fertilizers applied to apple trees, R. S. Marsh (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 145–148, fig. 1*).—Studies by the Illinois Experiment Station in Calhoun County, Ill., with Winesap apple trees, 26 yr. old in 1926 when the investigation began, showed no important differences, as indicated by the total nitrogen in the spurs, between several nitrogen carriers, such as sodium nitrate. calcium nitrate, cyanamide, and ammonium sulfate. Ammonium sulfate and nitrate of soda produced consistently larger total yields over a 6-yr. period than did cyanamide. Observations in the experimental orchards at Urbana in the dry summer of 1936 showed a greater accumulation of nitrates where adequate organic matter was present and clean cultivation practiced than in wetter years. Calcium cyanamide had no advantage over nitrate of soda with respect to nitrate accumulation.

Nitrogen content and growth response from fall and spring fertilizer applications to apple trees, G. E. Smith (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 133–136*).—Further studies (E. S. R., 76, p. 334) by the Missouri Experiment Station with sulfate of ammonia, nitrate of soda, and cyanamide as fertilizers for apple trees showed that the autumn applications of all three materials gave as good (if not better) growth as did spring applications. In the dry season of 1936 late spring applications of all materials were less effective than in the preceding year with respect to growth. Over several years, growth of fall-fertilized trees was the more uniform. Under Missouri conditions, where spring moisture is variable from year to year, it appeared advisable to apply fertilizers in autumn. In no case was any injurious effect observed from cyanamide.

Some nutritional factors involved in fruit setting in the apple, L. Greene (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 120, 121*).—The results presented were discussed in greater detail in a later paper (E. S. R., 77, p. 785).

Some anatomical aspects of apple flower and fruit abscission, L. H. MacDaniels (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 122–129, figs. 9*).—This study by the [New York] Cornell Experiment Station upon the structure of the abscission zone in several varieties of apple was conducted as a basis for investigations of physiological factors associated with the premature dropping of apple fruits, a serious consideration in varieties such as McIntosh and Wealthy. In Rome Beauty and Golden Delicious, long, flexible stems which permit the fruits to swing rather freely were important factors in decreasing abscission. In the morphological sense, the abscission of an apple flower or fruit is the cutting away of a modified branch or axis. The author compares the abscission process in early season with that at maturity and discusses the processes in general and in specific varieties such as McIntosh, with a tendency to drop, and in Rome Beauty, Northern Spy, and Delicious, which do not drop fruit so readily. Comparisons of abscission zones from fruits of McIntosh trees, showing a tendency to early dropping, with fruit trees that held their fruit failed to show any marked structural differences.

Apple thinning investigations, 1920 to 1935, R. C. Palmer and D. V. Fisher (*Canada Dept. Agr. Pub. 579 (1937), pp. 27, figs. 5*).—Of three spacings, viz, 3, 6, and 9 in., compared over a period of 16 yr. in an irrigated orchard planted in 1916 at the Dominion Experimental Station, Summerland, B. C., none had any outstanding influence on total yields. In three cases—McIntosh, Delicious, and Rome Beauty—the largest yields were recorded for 9-in. thinning and in the fourth variety, Newtown, for 3-in. spacing. Heavy thinning resulted in an increased set and a larger average size of fruit. In the McIntosh and Newtown, there was noted a tendency for heavy thinning to stimulate annual bearing. In Delicious and Rome Beauty, most of the trees fruited annually irrespective of the degree of thinning. There was some indication that heavy thinning of the fruit increased trunk diameter growth in McIntosh and Delicious without increasing materially their height or spread. The time of thinning had a significant influence on size of fruit at harvest in Transparent, Duchess, Rome Beauty, Newtown, and Wagener, but not in McIntosh and Delicious.

The effect of time of thinning on apple size, H. E. Knowlton (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 116–119*).—Investigations by the West Virginia Experiment Station with Oldenburg, Golden Delicious, Delicious, and Grimes Golden apples showed that the earlier the thinning treatment, the larger the fruit size at harvest. However, it was pointed out that late thinning has material advantages, especially in areas of possible midsummer hailstorms. The potential value of early thinning in promoting annual fruiting of biennial varieties leads to the suggestion that such varieties be thinned first, followed by varieties of annual habit.

A record of peach seed germination tests, M. J. Dorsey (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 257–263, figs. 2*).—An analysis of results secured by the Illinois Experiment Station in the germination of peach seeds resulting from a breeding study yielded some interesting facts, such as the need and value of afterripening seeds in a moist medium such as damp peat at about 40° F. Drying of seeds before stratification had no influence on germination. When seeds from peaches kept in a bushel basket in storage at from 35° to 37° without drying for 196 days were subjected to temperatures of 32°, 16°, 0°, and —10° for different periods, the seeds were killed almost completely at —10° and 0°. Practically no germination occurred in any of the uncracked pits at any temperature, but good germination was secured from cracked pits kept at 16° or above. In the case of Elberta seeds kept 112 days at room temperature, then held uncracked for 77 days at 40° in moist peat, the position of the seed in the soil had no significant effect on percentage of germination but did influence the straightness of the stems and seedlings. Among other findings were that an afterripening period of 29 days is practically as good as 60 days for Elberta seeds, either 1 or 2 yr. old. There was no marked difference between peat and sand as a stratification medium. The occurrence of dwarfed seedlings was traced to inadequate afterripening, but after one summer the dwarf took on normal growth.

Responses of young peach trees to nutrient deficiencies, O. W. Davidson and M. A. Blake (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 247, 248*).—Studies at the New Jersey Experiment Stations of 1-year-old Elberta trees growing in sand culture provided with six different nutrient treatments, one complete and the others lacking, respectively, in nitrogen, calcium, magnesium, phosphorus, and potassium, showed that each deficiency had a specific influence on the development of the plants. With no nitrogen, stem growth was restricted in length and diameter, leaves developed typical purplish-red spots,

and carbohydrates accumulated rapidly. With no calcium, root growth was greatly limited, stem growth was restricted in length but not greatly in diameter, and within 6 weeks the leaves developed characteristic discoloration. With no magnesium, the lower leaves developed necrotic areas within 3 or 4 weeks and dropped soon afterward, there was a great deficiency of carbohydrates, and stem growth was very slender, and there was considerable breakdown of leafy tissue. Without phosphorus, leaves were abnormally narrow and dark green, became characteristically mottled, and dropped within 7 weeks, while growth of fibrous roots was restricted. Without potassium, there was a rapid accumulation of carbohydrates during the early stages, followed by a crinkling of the leaves; large and small necrotic spots of a straw color appeared on the leaves and in many cases the margins were severely scorched; and later there was a revival of growth activity and improvement of color apparently due to reutilization of potassium, some of the trees exhibiting three such cycles of growth.

Some effects of four years of cover crops in a young peach orchard, F. P. Cullinan and J. H. Weinberger (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 242–246, figs. 3*).—As indicated by trunk growth increments and the yield of fruit, stable manure with cultivation was by far more effective than lespedeza, sweetclover, soybeans, crotalaria, or buckwheat when tested in an Elberta peach orchard at the U. S. D. A. National Agricultural Research Center, Beltsville, Md. It is pointed out, however, that in 3 of the 4 yr. there occurred periods of from 1 mo. to 6 weeks during the growing season when there was an acute shortage of rainfall. Soil moisture readings in 1934 under lespedeza and sweetclover showed the moisture to be at or below the permanent wilting percentage in the first 2 ft. for over 1 mo. Under soybeans, the permanent wilting percentage was reached for over 2 weeks, while in the cultivated plats at no time did the moisture come within 4 percent of the permanent wilting percentage. Similar conditions in other dry years showed that legumes reduced soil moisture by their early growth. Nitrate determinations in 1936 did not show that nitrate was particularly low in the plats where the trees made poor growth. In favor of the cover crops, the authors state that they all prevented erosion and improved soil texture and physical condition.

Incompatibility and sterility in the sweet cherry, Prunus avium L., M. B. Crane and A. G. Brown (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 2, pp. 86–116, pls. 4*).—In the sweet cherry self-incompatibility was found to be the rule, cross-incompatibility rather frequent and always expressed reciprocally. Of 66 varieties under study, 45 belonged to 11 incompatible groups within which all self- and cross-pollination failed. The oppositional factor hypothesis of East and Mangelsdorf (E. S. R., 55, p. 27) is said to offer a logical explanation for incompatibility in the sweet cherry. The pollen tubes were arrested in their growth down the styles, thus preventing fertilization. Degrees of generational sterility occur and are expressed by aborted pollen, imperfectly developed or nonviable seeds, and occasionally by differences in the proportion of fruits which set and reach maturity.

Strawberry varieties in southwest Texas, E. Mortensen (*Texas Sta. Bul. 556 (1937), pp. 32, figs. 18*).—Based on studies at the Winter Haven Substation, the author presents information on characteristics such as runner production, heat resistance, shipping quality, season of maturity, color, frost resistance, disease resistance, yield, and fruit quality of 71 varieties and strains. Missionary (Carolina strain), Klondike, Ettersburg 80, and "Banner" are recommended for commercial culture in southwest Texas. Ettersburg 121, Excelsior, Kallcene, and Narcissa are deemed worthy of trial for home use because of high quality and general adaptability.

After-ripening at 5° C. favors germination of grape seeds, F. FLEMION (*Contrib. Boyce Thompson Inst., 9 (1937), No. 1, pp. 7–15, figs. 2*).—The results of studies with seeds of *Vitis aestivalis*, *V. bicolor*, Concord, and Delaware showed that all would germinate at warm temperatures, but that such germination was very sporadic and required a long period. Much larger and more uniform germination was obtained when seeds mixed in a moist medium were subjected to a period of several months at about 41° F. prior to planting at 70°. Good seedling production was obtained in the spring from seeds stored over winter in a mulched cold frame. The removal of part of the seed coat over the radicle reduced germination.

Effect of extent and temperature of roots on transpiration of rooted lemon cuttings, J. BIALOGLOWSKI (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 96–102, figs. 6*).—Rooted Eureka leafy lemon cuttings, uniform with respect to cultural solution, air temperature, and relative humidity, light, and wind velocity, were subjected by means of thermostatically controlled water baths to differential root temperatures. The most active transpiration during light exposure occurred between 25° and 30° C. (77° and 86° F.). Water loss was retarded very markedly at root temperatures below 25° and above 35°. Transpiration during darkness was unaffected by temperature changes within a range of from 0° to 40°. At 25° the amount of roots required for transpiration was at least 130 mg of root dry weight per square decimeter of leaf surface.

Citrus manuring—its effect on cropping and on the composition and keeping quality of oranges, F. G. ANDERSSEN (*Jour. Pomol. and Hort. Sci., 15 (1937), No. 2, pp. 117–159, figs. 18*).—Differential fertilizer treatments laid out in an 8-year-old grove of Washington Navel oranges, all on rough lemon roots, showed that nitrogen is the outstanding limiting element. Legume cover crops without added nitrogen showed no demonstrable differences from the no-fertilizer treatments. Applications of superphosphate, potassium sulfate, and lime did not influence the size of the crop, but there was indicated a need of a balanced nutrient supply. Growth, as indicated in size of tree, color, and density of foliage, was not affected by any of the treatments.

Observations on fruit showed the thinnest rinds in the six plats with the highest phosphate content and the most significantly thick rinds where heavy applications of nitrogen and little or no phosphate were used. A high phosphorus and likely, also, a high calcium content in the fruit was associated with a low acid content. Potassium, on the other hand, was associated with high acidity. A high calcium content resulted in an increase in storage losses due to molds.

Loss of nitrogen through abscission of immature oranges, S. H. CAMERON (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 88–90, figs. 2*).—As a further contribution to the general subject (E. S. R., 73, p. 617), the author presents data to show that in the "on" year two young Valencia orange trees dropped 20,476 and 15,888 immature fruits containing approximately 54.87 and 49.71 g of nitrogen, respectively. In the succeeding "off" year, the same trees dropped 835 and 1,097 fruits containing 2.17 and 3.12 g of nitrogen. In fruits of equal dry weight, there was, with the advancing season, a steady decline in nitrogen content.

Water deficit in citrus, C. COMPTON (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 91–95, figs. 4*).—At the California Experiment Station at Riverside, observations on 6-year-old Washington Navel orange trees given frequent and infrequent irrigation showed that of the three factors that definitely affect water deficit in citrus, namely, high air temperature, lack of available soil moisture, and strong wind, the lack of available soil moisture was the most important

factor in producing a high relative saturation deficit in the leaves. In mid-July the relative saturation deficit was generally least at about 4 a. m., and greatest between 12 m. and 2 p. m., with little difference between treatments. In the second sampling period, starting August 22, when the soil moisture in the dry plat was at about the permanent wilting percentage in the first 4 ft., the relative saturation deficit was higher at all hours of the day in the leaves of the dry-plat trees. Irrigation of the dry plat on August 24 tended to equalize conditions in the leaves. A third period of sampling in early November during a strong north wind showed little difference between plats with respect to relative saturation deficit.

Cold storage studies of Florida citrus fruits.—III, The relation of storage atmosphere to the keeping quality of citrus fruit in cold storage, A. L. STAHL and J. C. CAIN (*Florida Sta. Bul. 316 (1937), pp. 44, figs. 12*).—In this third paper (E. S. R., 77, p. 193), the author discusses the effects of various gaseous atmospheres and humidity conditions on citrus fruit in cold storage. A high relative humidity was found essential in preventing loss of weight, retaining firmness, and preventing pitting. Both taste and texture of grapefruit were affected by the nature of the atmosphere, both O_2 and CO_2 proving harmful in high concentrations. Fruit stored in N_2 developed a musty, disagreeable taste, but retained firmness and bright color. Pitting was apparently increased by O_2 and slightly reduced by N_2 or by small amounts of CO_2. Sogginess, a condition first evident by soft, dull-colored areas at the blossom end and gradually extending through the entire fruit, was definitely induced by CO_2. Once initiated, sogginess was not overcome by treatments with O_2. Forced air circulation was found harmful with respect to the duration of keeping and the maintenance of weight. Still-air storage low in CO_2 and O_2 and high in relative humidity made possible good keeping for 4 mo. Covering stacked boxes with a tarpaulin produced a favorable environment on a small scale. The application of the findings to commercial storage practices is discussed. Appended is a preliminary report by Cain for a method for measuring CO_2 respired by citrus fruits.

Observations on the effects of gas storage upon Valencia oranges, R. M. SAMISCH (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 103–106*).—In studies at the University of California in which Valencia oranges stored at 32°, 36°, 45°, and 70° F. were subjected to different atmospheres, there was noted a tendency for carbon dioxide (from 18 to 22 percent mixed with air) to produce injury to the rind. The condition was aggravated with increasing temperature but at 70° all lots were so badly decayed at the end of the 3-mo. experimental period that comparisons were impossible. Flavor was not materially affected by carbon dioxide, but fruit stored in 99 percent nitrogen and 1 percent oxygen had a pronounced off-taste. Chemical analyses of the fruits showed clearly that the heavier losses in respirable materials occurred in air. As indicated by the loss of sugar, the rate of respiration was almost three times as high in the peel as in the pulp.

Fruit thinning experiments with Deglet Noor dates, R. W. NIXON and C. L. CRAWFORD (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 107–115, figs. 2*).—Investigations conducted by the U. S. Department of Agriculture in the Coachella Valley of California showed that fruit thinning of Deglet Noor dates increases size of the individual fruits in proportion to severity of the treatment. Thinning to the point of capacity of the bunch accelerated ripening, but beyond this point the effect was slight. The best results, from all viewpoints, were secured from a total reduction at time of pollination of approximately 50 to 60 percent. Checking and blacknose were increased in direct proportion to the amount of thinning, regardless of the time of thinning.

Dahlia variety test, 1937, H. L. Cochran, D. D. Long, and B. E. Phillips (*Georgia Sta. Circ. 114 (1937), pp. 8*).—Information is presented on outstanding varieties, the qualities that make for desirability, etc.

Woody plants for New England gardens, parks, and roadsides, G. Graves (*Massachusetts Sta. Bul. 345 (1937), pp. 84, pls. 8*).—Based on actual trials, on general observations, and on the opinion of various authorities, there are presented notes on a large number of native and introduced ornamental plants. The main body of the text consists of an alphabetical arrangement of the various genera. Appended, also, are a few general lists which analyze the plants on a basis of growth habits and adaptability for specific uses.

Ornamental plantings on station grounds.—I, The evergreens, G. P. Van Eseltine (*Farm Res. [New York State Sta.], 4 (1938), No. 2, pp. 5, 10, fig. 1*).—An inventory is presented of evergreens planted on the station grounds.

The freezing temperatures of some fruits, vegetables, and florists' stocks, R. C. Wright (*U. S. Dept. Agr. Circ. 447 (1937), pp. 11*).—The results of freezing determinations made in connection with storage investigations with fruits, vegetables, and other plant materials are presented in tabular form. The author points out that different individuals of the same variety or strain, when grown under different or even under similar conditions, may have somewhat different freezing points. The data presented are said not to be absolute, but rather danger points at or near which damage may occur. The phenomenon of undercooling is discussed, in which the temperature under certain conditions may drop under the actual freezing point without subsequent injury to the tissues.

Agricultural insecticides and fungicides (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1937, pp. 20–22*).—Results are briefly noted of field tests of mineral oils and studies of injury to foliage by bordeaux mixture and other copper fungicides and formaldehyde and of the effectiveness of mothproofing materials and repellents and of ant poisons.

Analyses of materials sold as insecticides and fungicides during 1937, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 635 (1937), pp. 16*).—Herein are presented in the usual manner (E. S. R., 77, p. 45) the results of analyses of materials collected in 1937.

FORESTRY

Report of the Chief of the Forest Service, 1937, F. A. Silcox (*U. S. Dept. Agr., Forest Serv. Rpt., 1937, pp. 54*).—This is the customary annual report (E. S. R., 76, p. 632) containing information on major forestry events of the year, national forest administration, research activities in forest economics, range management, forest management, forest products, etc., and statistical data.

[Forestry studies conducted by the Mountain Substation] (*Georgia Sta. Rpt., 1937, p. 65*).—Brief notes are given on improvement cuttings in white pine plantings and the unsuitability of 2-yr. seedlings of white pine for underplanting in understocked hardwood stands.

Sulphuric acid treatment to increase germination of black locust seed, H. G. Meginnis (*U. S. Dept. Agr. Circ. 453 (1937), pp. 35, figs. 12*).—Experiments conducted at Holly Springs, Miss., showed that steeping hard seed of black locust in sulfuric acid increased and accelerated seed germination. Acid treatment was found more effective and more practical than hot water in large-scale nursery practice, since treated seed can be kept for some time without losing its viability. Germination of acid-treated seed compared favorably with

that of scarified seed. In nursery sowings, acid-treated seed gave about twice as many seedlings as untreated seed. Abnormally high temperatures intensified the action of the acid, but the effect could be offset by reducing the period of immersion in the chemical. In practice, temperature effects can best be eliminated by restricting experimental trials and subsequent treating operations to periods of normal temperatures, ranging from about 60° to 80° F. Because seeds of different lots vary widely with respect to structure and permeability of the outer coats, preliminary tests for a given temperature range are required to indicate the correct length of exposure to acid.

Forest restoration in Missouri (*Missouri Sta. Bul. 392 (1937), pp. 153, figs. 24*).—Papers prepared by various members of the station staff, the Missouri State Planning Board, the U. S. D. A. Forest Service, the Resettlement Administration, and the American Legion are presented as follows: Forest Land Priorities as Revealed by the Census, by E. A. Mayes (pp. 9–14); Physical Aspects of Land in Relation to Forest Use, by H. H. Krusekopf (pp. 14–16); Forest Use and Economic Considerations Determining Forest Location, by R. H. Westveld and C. H. Hammar (pp. 17–22); Timber Production, by Westveld (pp. 23–30); Stream Flow and Flood Control—A Forester's Viewpoint, by R. H. Peck (pp. 31–34), and An Engineer's Viewpoint, by H. C. Beckman (pp. 34–36); Control of Erosion, by L. D. Baver and Westveld (pp. 36–39); Game and Fish Habitats, by R. Bennitt and W. O. Nagel (pp. 40–44); Recreation (pp. 44–48); Economic and Social Objectives, by Hammar and Mayes (pp. 48–50); Wealth and Income From Timber Production, by Hammar and Westveld (pp. 51–57); Supplementary Income and Wealth From Recreation, by Hammar (pp. 57–60); Fire Control, by P. D. Kelleter and E. M. Bruner (pp. 61–69); Grazing Control, by R. R. Hill et al. (pp. 70–78); Tax Delinquency as a Factor, by Hammar (pp. 79–83); Financial Difficulties of Forest Land Counties, by E. E. Sparlin (pp. 83–87); Suggested Readjustment During the Transition Period, by Hammar (pp. 87–95); Federal Aids in Forest Restoration and Maintenance, by A. G. Hamel (pp. 97–106); Divisions Between State, Federal, and Local Responsibilities, by L. F. Watts (pp. 107–111); Division Between Public and Private Ownership of Forest Lands, by Westveld (pp. 113, 114); Extent and Character of Farm Forestry (pp. 114–117), and Suggested Aids to Private Forestry (pp. 117–123), both by Peck; Public Participation in the Management of Private Forests, by Westveld (pp. 123–126); Missouri's Fiscal Capacity Compared With That of States With Existing Programs, by Westveld and F. R. Graham (pp. 127–130); Needed Administrative Agencies, by Westveld (p. 130); and A Long Time Plan for Reforestation in Missouri—A Research Program, by W. M. Baker (pp. 131–139), A Fiscal Plan, by Hammar (pp. 139–148), and An Administrative Plan, by Bruner (pp. 149–153). An introduction by Westveld and Hammar is also included.

Planning, constructing, and operating forest-fire lookout systems in California, S. B. Show, E. I. Kotok, G. M. Gowen, J. R. Curry, and A. A. Brown (*U. S. Dept. Agr. Circ. 449 (1937), pp. 56, figs. 21*).—This circular contains general information pertaining to the planning and developing of a detection system; the construction of lookouts and other facilities; the selection of capable lookout observers; the cost of adequate detection by the lookout system; and appended data on the use of phototransit cameras and profilers, the construction of relief models, etc.

Fire Control Notes, December 6, 1937 (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, [No. 7] (1937), pp. 353–411, figs. 20*).—Prepared in the usual manner (E. S. R., 78, p. 201), this publication includes general specifications on fire-control technic and equipment and on record forest fires, etc.

Forest Products Laboratory research program, 1937–1938 (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1937, pp. [108]*).—A list of projects is presented with comments as to status in July 1937, plans for the current year, publications issued, etc.

DISEASES OF PLANTS

[Plant disease work by the Bureau of Entomology and Plant Quarantine] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1937, pp. 17–19, 29–38, 43–47, 84–98*).—Brief summaries are given of work on the control of phony peach and peach mosaic diseases; citrus canker eradication; Dutch elm disease eradication; white pine blister rust control; wheat black stem rust quarantine enforcement; barberry eradication; and inspection and quarantine work.

[Phytopathological studies by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1937, pp. 10–12, 13, 17, 20, 21, 22*).—Reports of progress are included on the following: Diseases of field peas and vetches in the Cotton Belt; Dutch elm disease; white pine blister rust on sugar pine; need of acidity in nurseries; cypress canker; wood decay; cranberry rot control; chemical control of plant-parasitic nematodes; seed-infesting nematodes; bud and leaf nematode; sugar beet diseases (curly top- and leaf spot-resistant varieties and viruses); control of tobacco seedbed diseases; and weeds in relation to Granville wilt of tobacco.

The Plant Disease Reporter, January 15 and February 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 1, pp. 26, figs. 2; 2, pp. 27–53, figs. 3*).—The following items of interest are included in these issues:

No. 1.—Reactions of varieties of snap beans to rust (*Uromyces phaseoli typica*), by G. R. Townsend; seed infestation with *Glomerella* and *Fusarium* in the 1936 cotton crop in North Carolina, by S. G. Lehman; plant disease survey in southwest Texas, including diseases of tomato, potato, eggplant, and pepper, 16 of which apparently being first reports for the State, by P. A. Young, G. E. Alstatt, and A. L. Harrison; notes on fruit diseases in the Ozark section of Missouri in 1937, by M. A. Smith; progress report on investigation of brown rot of stone fruits, due to *Sclerotinia* spp., conducted during 1937 in Clark County, Washington, by G. A. Huber and K. E. Baur; observations on diseases of fruit crops in Dade County, Florida, in 1937, by G. D. Ruehle; nut diseases in the Pacific Northwest in 1937, by P. W. Miller; *Verticillium* wilt of maple and elm in the Pacific Northwest, by J. L. Bedwell and T. W. Childs; dodder in forest nurseries, by D. H. Latham, K. F. Baker, C. Hartley, and W. C. Davis; *Phomopsis* blight in some forest tree nurseries, by W. C. Davis and D. H. Latham; and brief notes on plant diseases, including potato late blight in eastern Virginia, *Verticillium* on coleus in Connecticut, and rust on chrysanthemum in Louisiana.

No. 2.—Records of a witches'-broom on black locust (*Robinia pseudoacacia*) and a similar disease on honey locust (*Gleditsia triacanthos*), by T. J. Grant and C. Hartley; an occurrence of soft rot of hyacinth (probably *Bacillus carotovorus*), by H. G. MacMillan and O. A. Plunkett; notes on fruit (apple, cherry, and peach) diseases in the Ozark section of Arkansas in 1937, by J. C. Dunegan; summary of apple disease survey in Pennsylvania, 1937, by R. S. Kirby, G. L. Zundel, A. H. Bauer, and O. D. Burke; bean diseases in Colorado in 1937, by W. J. Zaumeyer, B. L. Wade, and J. R. Mullin; "purple top" wilt of potato in North Dakota, by W. E. Brentzel; occurrence of tobacco diseases in Virginia in 1937, by J. A. Pinckard; some new hosts for *Corticium stevensii* in Louisiana, by E. C. Tims and P. J. Mills; and brief notes on *Phytophthora*

root rot of calla lily in Florida, anthracnose (*Glomerella cingulata*) of privet in Ohio, scab (*Fusicladium pyracanthae*) on firethorn (*Pyracantha* sp.) in Ohio, and rust (*Cumminsiella sanguinea*) on Oregon grape (*Mahonia aquifolium*).

[Plant disease research in the Southern States] (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 76, 128, 278, 310–313*).—Abstracts of the following papers of interest to phytopathology, presented at the convention of the Association of Southern Agricultural Workers at Jackson, Miss., February 5–7, 1936, are included: The Zinc Content of Soils, Soil Reaction, and Rosette of Pecans, by H. M. Boggs and A. O. Alben (p. 76) (U. S. D. A.); and A Preliminary Study on the Influence of Bordeaux Mixture on the Growth and Transpiration of the Marglobe Tomato, by J. B. Edmond and F. S. Andrews (p. 128) (S. C.).

The following papers were presented at the convention held in Nashville, Tenn., February 3–5, 1937: A Method of Determining Nematode Resistance in Beans and Cowpeas in the Seedling Stage, by K. C. Barrons (p. 278) (Ala.); Cotton Wilt Survey Summary of 1936, by H. D. Barker and C. D. Sherbakoff (p. 310); Bunchy-Top of Carrots, by A. G. Plakidas (p. 310) (La.); Effect of Soil Application of Sulphur on the Control of Potato Scab (p. 311) (Tex.) and Fungicidal Properties of Sulphur (p. 311), both by J. J. Taubenhaus; Weather Conditions and Plant Disease Development (p. 311) (U. S. D. A.) and Effect of Mosaic Disease on Yield and Quality of Snap Beans (p. 312), both by W. D. Moore; Effect of Legumes on Following Crops [Especially on Corn Root Rot] (p. 312) and Wheat Breeding at the University of Tennessee Agricultural Experiment Station [With Special Reference to Diseases] (p. 312), both by C. D. Sherbakoff (Tenn.); and Control of Fruit Diseases by Spraying, by J. O. Andes (pp. 312, 313) (Tenn.).

[Plant disease work by the Colorado Station] (*Colorado Sta. Rpt. 1937, pp. 15, 21, 22, 35*).—Progress reports are given on the control of bacterial wilt and winter-killing in alfalfa, peach mosaic (E. S. R., 77, p. 352), *Phytophthora* rot of cucumber, *Rhizoctonia* as a vascular parasite of beets, onion pink root, rotting of Chinese elms in storage, *Fusarium* root rot of carnations, a new fungus disease of snapdragons, *Fusarium* and *Alternaria* diseases of gardenias, and soil treatment for potato scab.

[Plant disease work by the Georgia Station] (*Georgia Sta. Rpt. 1937, pp. 14, 15, 16, 17, 41–45, fig. 1*).—Brief reports of progress are given on studies of cotton wilt; peanut leaf spots (*Cercospora personata* and *C. arachidicola*); selection and breeding for control of tomato wilt (*Fusarium lycopersici*); disease control in field-grown tomato plants; control of root rot of beans (*Rhizoctonia solani, Macrophoma phaseoli, Sclerotium rolfsii*, and nematodes); watermelon wilt control by breeding and selection; cotton seed treatment; oat smut control; winter injury to peach trees; and diseases (chiefly fungus) of Austrian winter peas and vetch, and their control, by J. L. Weimer.

Kansas mycological notes, 1935, C. L. Lefebvre and C. O. Johnston (*Kans. Acad. Sci. Trans., 39 (1936), pp. 95–101*).—This contribution by the Kansas State College and the U. S. Department of Agriculture includes data on the severe wheat stem rust epidemic; black chaff, glume blotch, and leaf blotch of wheat; seasonal notes on various plant diseases; and a list of fungi found in Kansas on new hosts, with those new to the State indicated.

[Plant disease work at the New York State Station] (*New York State Sta. Rpt. 1937, pp. 54–65, 91, 92, 93–95*).—Reports of progress are given of studies of apple scab (*Venturia inaequalis*) control, winter injury of apple trees, injury to apple trees by boric acid injections, crown gall on budded apple trees (E.

S. R., 71, p. 210), new mosaic-escaping varieties of red raspberries, physiological studies of raspberry mosaic, raspberry virus disease control, strawberry chlorosis, cabbage yellows, identification and investigation of new *Fusarium* diseases (new tomato wilt and cantaloup wilt), protection of pea seeds with red copper oxide-graphite, pea root rot, damping-off in greenhouses, red copper oxide as a foliage fungicide; Long Island investigations of potato seed treatment (E. S. R., 76, p. 56), root knot nematode (E. S. R., 76, p. 57), and potato scab control; downy mildew and virus diseases of hops; seed-borne micro-organisms of beans, corn, and peas; and chemical seed protectants (E. S. R., 78, p. 346).

The plant diseases of Great Britain: A bibliography, compiled and annotated by G. C. AINSWORTH (*London: Chapman & Hall, 1937, pp. XII+273*).—This is an annotated bibliography arranged by crop groups and provided with author, and host and parasite indexes.

Potash deficiency symptoms, O. ECKSTEIN, A. BRUNO, and J. W. TURRENTINE (*Kennzeichen des Kalimangels. Signes de manque de potasse. Berlin: Verlagsgesell. Ackerbau, 1937, pp. XII+235, pls. 55, figs. 41*).—This is a compendium of information on the subject, with a bibliography and index included. The effects on cell structure are illustrated, and the illustrations in color show the symptoms on a wide variety of plants. The text is given in German, French, and English.

Chimaeras: A summary and some special aspects, W. N. JONES (*Bot. Rev., 3 (1937), No. 11, pp. 545–562, fig. 1*).—This article reviews present knowledge and viewpoints regarding the origin and nature of chimeras and their biological significance. The possibility of creating or utilizing chimeras giving resistance to certan plant diseases is referred to. There is a bibliography.

Indoleacetic acid galls of a secondary type, N. A. BROWN and F. E. GARDNER (*Phytopathology, 27 (1937), No. 11, pp. 1110–1113, figs. 2*).—The secondary galls induced by indoleacetic acid-lanolin mixture were demonstrated not to be produced through any inadvertent carrying over of the growth substance to other parts of the plant by insects or watering, but to arise, as their deep-seated initial development shows, through some internal condition. It is believed possible that there is an overabundance of growth substance brought about in some bean plants when the indoleacetic acid-lanolin mixture is added to plants already well supplied with their own growth substance. This overbalance the plant is unable to adjust, and the number of secondary galls appearing may represent the extent to which the maladjustment of the plant is subjected. It is now apparent that the presence of the crown gall organism (*Bacterium tumefaciens* [=*Phytomonas tumefaciens*]) is not essential to the formation of galls of secondary type, the secondary overgrowth being formed by the gall-stimulating substance given off by the bacteria in the primary gall. The appearance of secondary galls on bean plants bearing primary galls induced by indoleacetic acid indicates that the stimulus of gall-inciting substances can move through the stem for considerable distances. Speculative analogies with the primary and secondary tumors of animals are drawn.

Virus diseases of plants: A bibliography, D. ATANASOFF (*Phytopath. Ztschr., 10 (1937), No. 4, pp. 339–463*).—This supplementary bibliography is prepared in the same way as the first volume, previously noted (E. S. R., 72, p. 790).

Bacteriophage in relation to plant diseases, H. KATZNELSON (*Bot. Rev., 3 (1937), No. 10, pp. 499–521*).—This comprehensive, critical review (with 79 literature references) by the Washington Experiment Station discusses the history of phage studies, methods, bacteriophagy in relation to bacterial diseases of plants, and phage therapy in animal and plant diseases.

Tolerance of liquid air temperatures by spore-free and very young cultures of fungi and bacteria growing on agar media, C. B. LIPMAN (*Bul. Torrey Bot. Club, 64 (1937), No. 8, pp. 537–546, fig. 1.*).—In two experiments by the University of California, after 24- and 48-hr. cultures of several species of fungi and bacteria had been exposed for 48 hr. to liquid air temperatures on their normal agar media, 8 of the 12 fungi and all but 1 of the bacteria grew normally. The significance of these findings is discussed, and a theory for explaining them is proposed.

Method of isolating single hyphal tips of Actinomyces, M. M. AFANASIEV (*Phytopathology, 27 (1937), No. 12, pp. 1182, 1183*).—Isolation of pure strains of *Actinomyces* was made by cutting off single tips of aerial hyphae from mycelium grown on albumin agar in Petri dishes. A glass needle, with bent tip, was set in a rubber tube clamp and fastened to a cork, which in turn was attached to the diaphragm condenser of a microscope. The glass needle was fixed horizontally in the clamp, with the fine point reaching to the microscope field. The tip of an aerial hypha, grown in a vertical position, was touched with the point of the needle previously dipped into a sterile, very dilute sucrose solution. The hyphal tip, which stuck to the needle, broke away as the condenser was raised and the needle was carefully withdrawn. The point of the needle was always examined under the microscope to determine whether a single tip had been isolated.

Inoculation of some economic plants with Phytophthora cactorum and P. citrophthora, C. O. SMITH (*Phytopathology, 27 (1937), No. 11, pp. 1106–1109, fig. 1*).—Inoculations with a strain of each of these 2 fungi (isolated, respectively, from *Juglans* and *Citrus*) were made by the California Experiment Station in woody stems (through wounds made by a 7 mm cork borer subsequently wrapped with nurseryman's tape) of 49 plant species. Some response to each of the fungi was usually shown. Among other plants infected by both fungi, the following developed lesions from each having a radius of more than 10 mm after 90 days: *Castanea* sp., *Ficus* (Mission fig), *Hakea* sp., *Quercus lobata, Cedrus deodara, Cydonia oblongata, Eriobotrya japonica, Photinia arbutifolia, Juglans* spp., *Prunus* spp., and *Populus fremonti.* Other genera giving positive results with both fungi were *Annona, Carya, Ceratonia, Citrus* (including fruit rot in lemon), *Diospyrus, Eucalyptus, Fraxinus, Juniperus, Olea, Persea, Pinus, Pyrus, Rosa,* and *Ulmus. J. formosa, J. insularis,* and *Psidium guajava* were infected only by *Phytophthora cactorum,* while *Pinus muricata* was infected only by *Phytophthora citrophthora.* Among the more susceptible plants were 6 species of *Juglans* and 12 of the Rosaceae, including 7 species of *Prunus.* Plants other than those in the first list developed smaller lesions, and it is probable that these slightly infected hosts, under natural conditions, would rarely if ever become diseased. Different species of *Citrus* were infected by *Phytophthora citrophthora* with lesions having a radius of 39–120 mm, while *P. cactorum* caused lesions with a radius of only 3-5 mm on *Citrus* hosts. The conifers (*Cupressus, Pinus,* and *Juniperus*) were negatively or only slightly infected.

Spraying greenhouse seedlings with red copper oxide, J. G. HORSFALL and R. F. SUIT (*Farm Res. [New York State Sta.], 4 (1938), No. 2, p. 9, figs. 2.*)—On the basis of experimental results and reports by growers it is suggested that greenhouse seedlings subject to infection with damping-off and leaf diseases be sprayed at weekly intervals with red copper oxide (1–50) or its commercial preparation Cuprocide 54 (1.5–50). Treatments with this fungicide were also used with safety and success on transplants for control of leaf spots.

The influence of spreaders and stickers in relation to the fungicidal efficiency of insoluble copper spray films, F. A. DAVIES and J. F. ADAMS (*Pe-

ninsula Hort. Soc. [Del.] Trans., 50 (1936), pp. 32–39, figs. 2).—In this study by the Delaware Experiment Station, the addition of inert spreaders (e. g., bentonite and kaolin) to such insoluble copper sprays as Z–O or Coposil had but little effect on fungicidal efficiency. Wyo-Jel reduced the efficiency of both Z–O and Coposil, probably due to chemical interference by the magnesium oxide in the Wyo-Jel. This interference was offset by addition of acid lead arsenate at the recommended rate of 3 lb. per 100 gal. of spray. Adherence, as measured by the fungicidal efficiency after repeated washing, was greater with Wyo-Jel than with kaolin or bentonite, but the differences were small and would only under certain conditions offset the reduction in efficiency.

Spinach and cabbage seed treatment, H. T. Cook (*Virginia Truck Sta. Bul. 96 (1937), pp. 1489–1510, figs. 5*).—Two years' experiments on the comparative value of various seed treatments for cabbage and spinach are presented. The desirable properties of a good seed-treatment fungicide are given, and the materials tested included three copper, five zinc, and two mercury fungicides and one grade of graphite.

The experiments (1935) demonstrated that even under conditions especially favorable for seed decay it was possible by treatment to obtain satisfactory stands of spinach with 20–30 percent less seed than is generally used. Under the same conditions even excessive amounts of untreated seed failed to produce a stand. Planting spinach seeds at various rates had no effect on the protection afforded by the treatment. The data indicated that with spinach seed 1–2 percent of the various copper and zinc materials should be applied. Comparison of the various fungicides tested indicated that in general equally good protection is obtained from zinc oxide, red copper oxide, and Vasco 4 on spinach seeds. AAZ special zinc oxide and copper oxychloride also provided good protection in some of the plats but were not consistently as good as the other materials. Fungex was not as effective as the other fungicides. A mixture of zinc oxide and red copper oxide was no better on spinach seeds than either one of the materials alone. An old dark-brown-colored red copper oxide proved as effective as a fresh bright-red one, indicating that red copper oxide may oxidize to a considerable extent and still afford good protection. The various grades of zinc oxide and Vasco 4 were equally effective on spinach seeds, while Semesan was considerably less so than any of the other treatments. Ceresan was very effective in protecting spinach seeds from decay and is considered worthy of future testing.

Graphite did not affect the germination of spinach seeds or the action of the fungicides and exerted no fungicidal action itself, but it reduced the amount of friction by the various seed treatments. It was not necessary for the protection of the spinach seeds from mechanical injury, but proved of value in reducing the amount of wear and breakage of the seed drills.

The amount of seed decay was closely related to soil moisture and temperature at planting time and immediately thereafter. It was most destructive with moderate to high moisture and moderate to high temperatures. Conditions favoring seed decay are usually prevalent when the early fall spinach is planted, and therefore seed treatment is then imperative. Such conditions may also exist for short periods at other times when spinach is planted, so that treatment of all spinach seed is recommended.

Zinc oxide, red copper oxide, Vasco 4, and Semesan seed treatments of cabbage were all effective for preventing seed decay, but red copper oxide was not as effective as zinc oxide or Vasco 4 and sometimes stunted the plants. Zinc oxide and Vasco 4 caused severe seed damage by friction. Addition of graphite with the fungicide eliminated the friction and damage to the seed, and its use

with treated cabbage and other crucifer seed to be planted with a seed drill is considered essential.

The treatments are specific for some seeds. Thus spinach may be safely treated with either red copper oxide or zinc oxide; cabbage may be treated safely with zinc oxide but not always with red copper oxide; and peas are stimulated by red copper oxide but stunted and yellowed by zinc oxide.

Observations on the comparative morphology and taxonomic relationships of certain grass smuts in western North America, G. W. Fischer (*Mycologia, 29 (1937), No. 4, pp. 408–425, figs. 18*).—This cooperative study by the U. S. D. A. Bureau of Plant Industry and the Washington Experiment Station deals with the comparative morphology and taxonomic relationships of the smuts of barley grasses, bromegrasses, and wheatgrasses in the Northwest heretofore known under the names *Ustilago lorentziana*, *U. bromivora*, and *U. bullata*, respectively. It is considered that these actually represent one composite species, probably containing numerous well-defined physiologic races. Since *U. bullata* holds priority over the other names, it is proposed that this name apply to the species, and an emended description is accordingly given, with a list of its North American hosts (5 species of *Agropyron*, 23 of *Bromus*, 1 of *Elymus*, 7 of *Hordeum*, and 1 of *Sitanion*, 10 of these hosts being reported for the first time).

The possibility of insect transmission of alfalfa dwarf, J. L. Weimer (*Phytopathology, 27 (1937), No. 6, pp. 697–702*).—Field observations made of the virus disease known as alfalfa dwarf suggest that it is insect-transmitted. Caged alfalfa plants growing near infected plants did not become dwarfed, while uncaged plants did. None of the insects tested, which included aphids, thrips, leafhoppers, cucumber beetles, etc., transmitted the disease to alfalfa plants under the conditions of the experiment. The work was conducted cooperatively by the California Experiment Station and the U. S. D. A. Bureau of Plant Industry.

Physiologic races of Ustilago hordei, V. F. Tapke (*Jour. Agr. Res. [U. S.], 55 (1937), No. 9, pp. 683–692*).—In this study by the U. S. D. A. Bureau of Plant Industry in cooperation with the [New York] Cornell and North Carolina Experiment Stations, 8 physiologic races were found in 200 collections from 26 States. The most widely distributed race was collected in 21 of the 26 States, and it was also the most generally prevalent, occurring in 114 of the 200 collections. In California and Washington, another race was conspicuously widespread and prevalent, occurring in 51 of the 60 collections from these States.

In a 1-yr. test with 28 winter varieties or selections, but little clear-cut differential host response to the 8 races was observed. However, there were marked differences in varietal response to winter injury, and a better knowledge of the influence of this factor on the occurrence of covered smut in winter barleys is deemed to be needed.

Rust resistance in the garden bean, C. T. Wei (*Phytopathology, 27 (1937), No. 11, pp. 1090–1105, fig. 1*).—In 50 bean (*Phaseolus vulgaris*) varieties, 5 major types of infections by *Uromyces appendiculatus* were distinguished, based on the extent of necrosis on the one hand and the amount of sporulation on the other. These types, in descending order of resistance, are designated 0, 1, 2, 3, and 4, and type 0 is further subdivided into 0o, 0a, and 0b and 1 into 1a and 1b, according to the extent and type of necrosis. 0, 1, and 2 are considered as resistant types and 3 and 4 as susceptible, while plants showing both susceptible and resistant types of infection (mesothetic) are designated as X types, with the subdivisions Xa and Xb.

Temperatures of 16°–28° C. did not change the type of reaction, except that type-3 infection on X-type host was increased in proportion by both high and low temperatures, the latter prolonging the incubation period at the same time. Light was essential during the infection period for successful entrance of the fungus, and reduction in light intensity prolonged the incubation period. Beyond a certain extent it induced necrosis in type-4 infection and increased the proportion of type-3 infection on X-type hosts. It had no other effect on the type of infection.

Excess nitrogen increased the amount of infection per unit area of leaf and vice versa. Potassium had an entirely opposite effect, while the effect of phosphorus was indefinite. Variation in the nutrient supply tested did not change the type of infection, except that low N/K increased the type-3 infection on the mesothetic host. Lithium, boron, zinc, and germanium affected neither the amount nor the type of infection until their concentration was high enough to cause abnormal growth of the host.

On the X-type host any condition that retarded maturation was accompanied by an increase in type-0 infection, while any that hastened senescence encouraged the fungus development. The amount of infection also is generally decreased by the latter. Aging of the host tissue beyond a certain limit reduced the amount of infection. It did not materially affect the type of infection on most varieties, but the proportion of type 3 on the mesothetic host was increased with age until it entirely replaced the other two types of infection.

It is suggested that the nature of this protoplasmic resistance results from a combined action in which both the host and the parasite take part. Death of the host cell and parasite is probably due to the action of "toxins" and "antibodies" produced by the respective organisms.

Cauliflower browning resulting from a deficiency of boron, C. H. Dearborn, H. C. Thompson, and G. J. Raleigh (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 483–487*).—In a greenhouse experiment conducted by Cornell University with soil from a field in which browning had been serious the preceding season the disease was severe, whereas with small borax additions there was but little, and with borax at the rate of 7.5–25 lb. per acre there was none. Field experiments and farm tests confirmed the role of borax in the control of browning, and observations on rutabagas indicated similar results. In the field experiments on cauliflower little or no browning occurred on plats receiving 5 lb. or more of borax per acre, whereas the controls on two types of soil gave 24.4 and 49.3 percent of the trouble, respectively. None occurred on the 25-lb. plats of cauliflower, and in rutabagas none with applications of 6 lb. or more per acre.

Vein-mosaic virus of red clover, H. T. Osborn (*Phytopathology, 27 (1937), No. 11, pp. 1051–1058, figs. 3*).—A mosaic disease caused by a virus designated as "vein-mosaic" virus of red clover (*Trifolium pratense*) was transmitted by means of the pea aphid and by mechanical methods. Broadbean (*Vicia faba*), sweet pea (*Lathyrus odoratus*), red clover (*T. pratense*), white clover (*T. repens*), alsike clover (*T. hybridum*), crimson clover (*T. incarnatum*), white sweetclover (*Melilotus alba*), Canada white field pea (*Pisum sativum arvense*), and garden pea (*P. sativum*) were found to be susceptible. The virus proved active after heating to 58° C. for 10 min., but was inactivated when heated to 60° for 10 min. It was active after aging in vitro for 2 days, but was inactivated after 3 days' aging. Pea aphids acquired and transmitted the virus within a total period of 2 hr., but it was lost by them during a feeding period of 1 day on healthy plants.

Carbohydrate utilization by the corn Diplodias, K. Kinsel (*Phytopathology, 27 (1937), No. 11, pp. 1119, 1120*).—The growth of *Diplodia zeae* and *D. macrospora*, both causes of corn ear rot, was compared by the University of Illinois on a series of synthetic media offering different materials as carbon sources. These media were made up on the basis of a modified Richards solution with the carbon supplied in a quantity to make an M/6 solution. After 3 weeks' growth the fungal mats were collected on weighed filter papers, dried, and the average dry weight was obtained. *D. macrospora* made satisfactory growth on media containing common disaccharides or polysaccharides as carbon sources, but failed to grow on those with the following monosaccharides as carbon sources: Glucose, cerulose, fructose, galactose, xylose, arabinose, and glucose and fructose mixed. On a medium containing a mixture of glucose and sucrose the amount of growth was proportional to the amount of sucrose present. The closely related but more widely distributed and more vigorous *D. zeae* grew readily on all these synthetic media.

Effect of the genetic constitution of the host on the virulence of Phytomonas stewarti, E. J. Wellhausen (*Phytopathology, 27 (1937), No. 11, pp. 1070–1089, figs. 6*).—In studies by the Iowa Experiment Station, strains of *P. stewarti*[i] [=*Bacterium stewarti*] successively passed through seedlings of a genetically highly resistant inbred line of corn increased in virulence for corn, while the same strains successively passed through seedlings of a genetically very susceptible inbred line decreased in virulence. The greatest change usually occurred within the first six to nine passages. According to the methods employed the virulence of the wilt organism eventually reached a balance with the particular corn host, beyond which further passages had little effect. At this point of balance it caused a marked degree of stunting of its respective host but was unable to kill it. Successive passages through a susceptible variety of teosinte also decreased the virulence for corn, as well as for teosinte. Successive passages through highly resistant grasses unrelated to corn, such as sorghum, Reed canary grass, tall meadow oatgrass, proso millet, and others reduced the virulence for corn, but the organisms became more virulent for the different grasses through which they were being passed. Cultures highly virulent for corn were very slimy or watery on nutrient-dextrose agar, whereas those weakly virulent for corn were of a firmer growth character.

Isolation of variants from cultures of Phytomonas stewarti, G. L. McNew (*Phytopathology, 27 (1937), No. 12, pp. 1161–1170, figs. 2*).—The single colonies isolated from dilution plates seeded with virulent cultures of *P. stewarti*[i] (=*Bacterium stewarti*) differed in their pathogenic abilities. These variants were classified, according to their ability to produce necrotic lesions and wilting of 10-day-old sweet corn plants, as slightly virulent, weakly virulent, virulent, or highly virulent. Slightly virulent isolates occurred infrequently and apparently developed in broth after it had been seeded with inoculum from the stock culture on agar slants. Cultures from infected corn in New Jersey, New York, and Iowa were found to contain variants even after purification by five serial dilutions and single-colony isolations. Two of the virulent isolates produced a firm, white filiform streak on nutrient-dextrose agar rather than the typical faint yellow, spreading type of growth, but they did not retain their vitality so long as the latter type.

Variants differing in virulence were obtained from all cultures tested. From these results, it seemed apparent that a corn plant inoculated with a pure culture would be exposed to invasion by a number of pathogenic strains. The strains developing in the host would probably be the ones best suited to the environment, and, if selective growth occurs, the variant complex of a culture would be changed by host passage.

Crinkle leaf, a new disease of cotton in Louisiana, D. C. NEAL (*Phytopathology*, 27 (1937), No. 12, pp. 1171–1175, figs. 2).—The U. S. D. A. Bureau of Plant Industry in cooperation with the Louisiana Experiment Station has described a new disease of cotton, "crinkle leaf," which is said to be prevalent in certain soil tracts of Louisiana. The disease has certain similarities to previously described abnormalities, including crazy top, thrips injury, and inherited "round" or "crinkly" leaf, but has, however, definite and distinctive features (described) and is manifestly not hereditary. Its known distribution is sharply localized to certain definite areas in fields where it reappears year after year. Similar symptoms were obtained in the greenhouse after steam sterilization of Lintonia silt loam. Crinkle leaf has been observed on several varieties, but no varietal differences were found. Attempts to transmit the disease to healthy plants by injecting sap collected from various parts of affected plants and by grafting and budding were unsuccessful. The nature and cause of the disease are undetermined, but deficiency or excess of some of the minor elements in the soil has been suggested, though rendered somewhat doubtful by the fact that healthy scions grafted on affected plants have neither developed the disease nor removed it on the stocks.

The effect of three- and four-year rotations on cotton root-rot in the central Texas blacklands, C. H. ROGERS (*Jour. Amer. Soc. Agron.*, 29 (1937), No. 8, pp. 668–680, figs. 5).—In experiments by the Texas Experiment Station, three-year rotation combinations of corn, oats, sorghum, or fallow with cotton proved ineffective in reducing cotton root rot due to *Phymatotrichum omnivorum* (1928–36) in Houston soils at the Blackland Substation at Temple. On the other hand, 4-yr. rotations of cotton with the nonsusceptible crops corn, sorghum, and oats or wheat showed a consistent reduction. There was an average of over 100 percent more root rot in continuous than in rotated cotton. Small increases in lint yield were obtained in the 3- and 4-yr. rotations, but yield increases in the 4-yr. rotations were not proportional to the large decreases in root rot. A high early or midseason kill of cotton by root rot resulted in a markedly decreased yield, but fair yields were obtained in continuous cotton even under root rot conditions, provided the soil was fertile, and, by chance, root rot was delayed until late in the season. The number and viability of sclerotia, the primary carry-over stage of the fungus, were not reduced in the 3-yr. rotations as compared to continuous cotton. In the 4-yr. rotations, however, their number and viability were not only reduced but in the third-year interval from the last planting of cotton the total number and the number viable were markedly reduced.

The nature and interaction of genes conditioning reaction to rust in flax, W. M. MYERS (*Jour. Agr. Res.* [U. S.], 55 (1937), No. 9, pp. 631–666, pls. 3).—In this study by the Minnesota Experiment Station, the single physiologic form 4 and a collection of *Melampsora lini* were tested on 37 crosses involving 17 strains and varieties of flax. The immunity of Ottawa 770B in the field was shown to be conditioned by a single dominant factor, and in greenhouse tests with the rust collection immunity was shown to be dominant to near immunity, resistance, and susceptibility, while resistance was dominant to semiresistance and susceptibility in the crosses used. The reaction to the rust collection of crosses involving Ottawa 770B, Newland, C. I. 438, C. I. 416-3, and C. I. 712 was explained by assuming factors in two different allelic series, L and M, which are duplicate factors conditioning immunity. l^n and m^n condition near immunity, l^n being allelic to L and m^n allelic to M. l^r and m^r condition resistance to the collection, l^r being allelic to L and l^n, and m^r allelic to M and m^n. On the basis of this hypothesis, the genotype of Ottawa 770B is

LL mm; Newland, *ll MM*; C. I. 438, *LL m^r m^r*, C. I. 416–3, *ll m^n m^n*; and C. I. 712, *l^r l^r mm*. Further detailed results with the rust collection are presented.

In general, the reactions of hybrids to the rust form 4 were similar to their reactions to the collection. The same factors were indicated as conditioning immunity of Ottawa 770B and Newland to both inocula. The factors determining immunity and resistance to the collection in crosses involving the immune strain of Bolley Golden likewise conditioned immunity and resistance, respectively, to form 4. In hybrids involving the resistant strain of Bolley Golden, the same factor conditioned resistance to both rust inocula, and there was evidence that the *m^r* factor of C. I. 438, which conditioned resistance to the collection, determined immunity to form 4. Two duplicate factors appeared to be conditioning the resistance of Light Mauve to form 4, but this evidence was inconclusive.

Relation of livestock to the control of sclerotinosis of lettuce, J. G. Brown (*Phytopathology, 27 (1937), No. 11, pp. 1045–1050, fig. 1*).—According to work by the Arizona Experiment Station, livestock may prove either baneful or beneficial in relation to the control of lettuce sclerotinosis (*Sclerotinia sclerotiorum*), depending on the manner of feeding. Farm animals fed on lettuce refuse in corrals and barnyards distributed the disease, but if pastured on infected lettuce fields after harvest, livestock (especially sheep) may be useful in its control.

Sclerotinosis in the first crop of lettuce on land previously in alfalfa for several consecutive years appeared to attack the plants only from the soil. The irregular distribution of diseased plants and other attendant circumstances suggested infection from sclerotia in animal droppings. In feeding tests to determine whether living sclerotia could pass through the alimentary tract, sheep fed approximately 16,000 sclerotia of *S. sclerotiorum* digested to a varying degree 95–99.5 percent of the sclerotia eaten and evacuated in a whole condition 1.6 percent. Less than 1 percent of the evacuated sclerotia proved capable of growth. The maximum period for evacuation of living sclerotia by sheep was 4 days. A quarantine period of 4 days is therefore recommended for sheep that have pastured on affected fields.

Attention is directed to the value of the Luyet vital stain, when properly checked, for determining the viability of these sclerotia.

Experiments on latent infection of resistant varieties by the loose and covered smut of oats, P. F. Brandwein (*Bul. Torrey Bot. Club, 64 (1937), No. 7, pp. 433–444*).—Varieties of *Avena sativa* (Black Mesdag, Markton, Scottish Chief, Early Champion, Gothland, and Monarch) and *A. byzantina* (Fulghum), and strains of *A. strigosa* and *A. brevis* were grown for a year to test the hypothesis that covered smut (*Ustilago levis*) and loose smut (*U. avenae*), present as a nonsporulating infection, may affect resistant varieties. All seeds used were dehulled and examined for injury before use in the tests.

Data from examination of 880 greenhouse plants and 2,700 field plants indicate that varieties resistant to various physiologic races of these smuts are not injuriously affected by inoculation therewith. Cytological examination of inoculated resistant plants indicated that the mycelium is present in varying percentages in the coleoptile but penetrates no further. In inoculated nonresistant varieties the mycelium penetrates rapidly to the growing point, where it is found at about 30 days thereafter. This coleoptile infection of the resistant varieties and strains appears to have no adverse effects on the height, grain yield, culm production, heading, and ripening of such plants.

Varietal reaction of pea to pea-streak virus 1, W. J. Zaumeyer and B. L. Wade (*Phytopathology, 27 (1937), No. 10, pp. 1009–1013*).—Experiments were

conducted under greenhouse conditions for 2 yr. to determine the susceptibility of 47 varieties of peas to this virus. A variance analysis showed significant varietal differences, but all varieties showed some susceptibility. For both seasons Nott Excelsior and Little Marvel showed the most resistance and Champion of England and Phenomenon the least, though in 1936 alone Mammoth Melting Sugar was the most susceptible.

Negative correlation between the occurrence of polyphenol oxidase and diastase and the degree of incidence of "blackheart" of potato, B. N. Singh and P. B. Mathur (*Phytopathology, 27 (1937), No. 10, pp. 992–1000*).—Blackheart was induced in several lots of tubers by enclosure in hermetically sealed jars maintained at 48°–49° C. for 4 days. The incidence of the trouble was estimated quantitatively by cutting a given tuber so as to expose a maximum diseased area, which, expressed as a percentage of total cut surface, gave an approximate measure of the degree of incidence. Polyphenol oxidase and diastase activities of tubers proved to be negatively correlated with the degree of the incidence. There was an increase in temperature, an accumulation of CO_2, and a depletion of oxygen in the surrounding air with increasing storage time. It is suggested that a partial destruction of the enzymes due to heating of the tubers in summer is probably responsible for the condition.

Breeding for resistance to late blight in the potato, F. J. Stevenson, E. S. Schultz, C. F. Clark, L. Cash, and R. Bonde (*Phytopathology, 27 (1937), No. 11, pp. 1059–1070, figs. 2*).—Resistance to late blight of potato (*Phytophthora infestans*) was found by the Maine Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry to be inherited as a recessive character controlled probably by multiple genes. Certain progenies of crosses between two resistant varieties all proved resistant. The progeny of a cross between two susceptible sibs and of a susceptible variety selfed have shown segregations for resistance and susceptibility. Immunity has not been demonstrated, but many of the varieties obtained proved resistant enough to late blight to be grown successfully without bordeaux spraying even when the disease occurred on other varieties in epidemic proportions. The tubers of a number of the vine-resistant varieties were resistant also to tuber rot caused by the same fungus, as shown in both laboratory and field tests. It is indicated that resistance to late blight can be combined with other characters of economic importance, such as high yield, desirable tuber shape, shallow eyes, and good cooking quality.

Effect of bordeaux mixture on three varieties of potatoes with respect to yields, composition of tubers, and control of scab, E. O. and M. T. Mader (*Phytopathology, 27 (1937), No. 11, pp. 1032–1045, figs. 2*).—In tests conducted by Cornell University, applications of copper as bordeaux mixture retarded blooming in Irish Cobbler and Green Mountain potatoes. The tuber and foliage weights of sprayed Irish Cobbler, Green Mountain, and Rural Russet were larger than when unsprayed. More tubers were retained by sprayed than by unsprayed plants of the same variety. Bordeaux mixture retarded the enlargement of tubers in the fore part of their development. Tubers of all sprayed plants showed a marked reduction in scab. During early enlargement the largest tubers of both sprayed and unsprayed plants showed more scab infection, but since scabby tubers developed more slowly than healthy ones a higher percentage of scabby tubers occurred in the smaller weight classes at maturity. In the early stages of development the total nitrogen was higher for the tubers of sprayed plants, while at maturity those of unsprayed plants gave a higher percentage. The opposite occurred for the starch content. Reducing sugars and copper were higher for tubers of sprayed plants than for those of the unsprayed. The ratio of protein to starch was higher for tubers of sprayed plants

at the beginning of enlargement but lower at maturity, thus giving a lower ratio than for corresponding tubers of unsprayed plants. Tubers of sprayed plants darkened less on cooking and were somewhat mealier than those of unsprayed plants.

Cercospora oryzae on rice in the United States, E. C. Tullis (*Phytopathology, 27 (1937), No. 10, pp. 1005–1008, fig. 1*).—*C. oryzae* has been found in recent years on sheaths, leaves, peduncles, and glumes of rice in Alabama, Arkansas, Louisiana, and Texas. In a joint study of the disease by the experiment stations of the last three States in cooperation with the U. S. D. A. Bureau of Plant Industry, 58 varieties and hybrid selections proved resistant in 2-yr. tests. The pathogenicity of the fungus was demonstrated by inoculation of several rice varieties with pure cultures and subsequent reisolation. The fungus is apparently localized in the epidermal region, and conidia are produced on conidiophores that grow through the stomata. Since there are so many rice varieties and selections that appear highly resistant or immune, it is believed that control may be effected by further developments along this line.

A severe case of Rhizoctonia root rot of sugar beets after potatoes, W. F. Buchholtz (*Phytopathology, 27 (1937), No. 12, p. 1180, fig. 1*).—The Iowa Experiment Station reports a severe case of late canker root rot in sugar beets following potatoes, due to *R. solani*. Nearly 50 percent of the stand rotted on this ground, while only 1.6 percent rotted on adjoining land preceded by barley.

Downy mildew of tobacco, P. J. Anderson (*Connecticut [New Haven] Sta. Bul. 405 (1937), pp. 61–82, figs. 5*).—This "handbook" of information on downy mildew or blue mold of tobacco (with 62 literature references) takes up the history and name of the disease, the symptoms (with descriptions based on 1937 observations and diseased plants), the causal fungus (*Peronospora tabacina*), other hosts (*Nicotiana* spp., tomato, eggplant, and pepper), sources of infection in spring, influence of weather and climate, and control measures (cultural practices, fungicidal spraying of seedbeds, and vapor treatment).

Control of downy mildew of tobacco by vapors of benzol and of other organic substances, R. McLean, F. A. Wolf, F. R. Darkis, and P. M. Gross (*Phytopathology, 27 (1937), No. 10, pp. 982–991, figs. 3*).—Benzol vapor exerts a potent fungicidal effect upon *Peronospora tabacina* and has been demonstrated to be efficient in preventing and controlling downy mildew in tobacco seedbeds. Monochlorobenzene also proved effective. Benzol vapor in high concentrations was toxic or lethal to tobacco seedlings, but mixing with lubricating oil retarded its evaporation. An optimum concentration of benzol vapor was secured by means of such a mixture which was neither toxic nor lethal to tobacco seedlings, regardless of weather conditions, and proved fungicidally effective. In vapor treatments, properly constructed beds should be employed, they should be covered during treatment with a cotton fabric, like sheeting, and the evaporators should have a surface approximating a seventy-second of that of the seedbed and sufficient clearance for free evaporation.

Use of incomplete block replications in estimating tobacco-mosaic virus, W. J. Youden (*Contrib. Boyce Thompson Inst., 9 (1937), No. 1, pp. 41–48, fig. 1*).—Because of unsatisfactory results from other methods of studying the infectivity of solutions of crystalline tobacco-mosaic virus, the author devised a modification of the F. Yates set-up, which is described. A number of examples for different numbers of treatments are worked out.

Dilution curve of tobacco-mosaic virus, W. J. Youden (*Contrib. Boyce Thompson Inst., 9 (1937), No. 1, pp. 49–58, figs. 3*).—The data for 20 dilutions show that in the neighborhood of 0.1 mg of virus protein per cubic centimeter the solutions may be diluted without a corresponding decrease in lesions pro-

duced. There even appeared to be an increase in infectivity after moderate dilution. The method of incomplete blocks made possible the comparison of solutions that differed but little in concentration, consistent dilution curves being obtained with only 9 *Nicotiana glutinosa* plants using an arithmetical series of dilutions.

Purification of tobacco mosaic virus and production of mesomorphic fibers by treatment with trypsin, L. F. MARTIN, H. H. MCKINNEY, and L. W. BOYLE (*Science, 86 (1937), No. 2234, pp. 380, 381*).—Contrary to reports of earlier workers, the authors find the infectivity of trypsin-purified virus protein apparently as great as or greater than the controls, provided the preparation is freed from trypsin by subsequent treatment. When incubated with trypsin the apparently pure virus protein separated at pH 7.5 from the impure solution as mesomorphic fibers, while at pH 5 needle crystals were formed.

A comparative study of some effects of several different viruses on Turkish tobacco plants, W. M. STANLEY (*Phytopathology, 27 (1937), No. 12, pp. 1152–1160, figs. 3*).—"Tobacco-mosaic, aucuba-mosaic, masked tobacco-mosaic, green or yellow cucumber-mosaic, severe etch, tobacco ring spot, and latent mosaic viruses, when inoculated to small, medium-size, or large Turkish tobacco plants, stunt the growth of the plants. Tobacco- and aucuba-mosaic viruses stimulate protein metabolism, however, so that, even though the growth of the plants is stunted the total protein produced by the diseased plants is greater than that of normal plants. All of the other viruses studied caused a decrease in the total protein produced by the plants. Although severe symptoms and an increased protein content were characteristic of the tobacco- and aucuba-mosaic diseases, there appeared, in general, to be no direct correlation between the protein content of the diseased plants and the severity of the disease symptoms. The first extracts of frozen macerated plants were found to contain from 80 to 90 percent of the extractable protein nitrogen in the plants. The extracts of plants diseased with tobacco- or aucuba-mosaic viruses were found to contain two or three times more protein nitrogen than the extracts of normal plants. This increase in protein nitrogen was found to be due to the production in diseased plants of large amounts of high molecular weight virus protein. The relationship between virus protein and intracellular crystalline deposits is discussed."

An acquired partial immunity to the tobacco streak disease, J. JOHNSON (*Wis. Acad. Sci., Arts, and Letters, Trans., 30 (1937), pp. 27–34, pls. 5*).—Tobacco plants spontaneously affected in the field with streak, a virus disease characterized by necrosis in or along the leaf veins, regularly show "recovery" from the necrotic symptoms. In this cooperative study by the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry, about 800 plants, artificially inoculated in the greenhouse, all showed a similar recovery from the first attack of typical disease. When reinoculated with the virus, 130 recovered plants of various sizes, ages, and degrees of vigor in all cases failed to succumb to a second attack of the necrotic form. Of the same number of adequate controls, 115 yielded typical streak. Certain other species of *Nicotiana* behaved in a similar manner. Six other viruses failed to yield any significant protection from streak, and, conversely, the streak virus failed to protect the host from these other viruses tested.

It is believed that recovery from tobacco streak is a good example of acquired immunity, and that, in some vegetatively propagated host plants, artificial immunization against certain virus diseases may become a practical control measure.

Watermelon wilt and resistant varieties for its control, H. T. Cook (*Virginia Truck Sta. Bul. 97 (1937), pp. 1511–1526, figs. 11*).—Experimental work has indicated that the watermelon wilt disease may be effectively controlled in Virginia by using the wilt-resistant varieties tested or developed by this station and now available. Seed treatment and crop rotation are also discussed. The disease was first reported in the State in 1918 and is now one of the limiting factors in commercial watermelon production. The symptoms, cause (*Fusarium niveum*), and conditions favoring the disease are described, and the means of its spread are enumerated.

Influence of climatological factors in the development of Cercosporella foot rot of winter wheat, R. Sprague (*U. S. Dept. Agr. Circ. 451 (1937), pp. 40, figs. 15*).—This disease occurs in the prairie sections of the Pacific Northwest, where the annual rainfall is 14–25 in. Soil moisture and precipitation are closely linked, especially toward harvest. Field and laboratory studies in cooperation with the Oregon, Washington, and Idaho Experiment Stations indicate that the greater the soil moisture (until near the saturation point) the greater the amount of foot rot, though other factors may modify this influence. Foot rot also increases with an increase in relative humidity at the soil surface, and winds often prevent serious attacks by drying out the surface soil though they may kill many culms weakened by early attacks. Good growing temperatures for the host are also usually favorable to the parasite, although the latter can thrive at lower temperatures than the host. Mean daily temperatures above 60° F. are considered nearly as effective as low soil moisture in checking the disease late in the season. Foot rot occurs in parts of the Columbia River Basin where mean temperatures for the growing season usually are 40°–50°. *C. herpotrichoides* makes optimum growth in the soil at about 50°, grows readily at cooler temperatures, but does not thrive in soils above 59°. In culture, the optimum temperature for growth is about 70°, and the maximum 86°. Freezing temperatures injure the smaller, weaker culms, permitting the fungus to infect them during early spring, but they are not as directly important in the development of the disease as formerly suspected. Light has no observable influence on the action of the fungus.

Plants with the heaviest vegetative growth in early spring are most susceptible, but to sustain a destructive attack heavy rains must occur in early and midspring season. The factors affecting the development of foot rot are graphically summarized.

Sclerotium blight of wheat, P. A. Young (*Phytopathology, 27 (1937), No. 11, pp. 1113–1118, figs. 2*).—The Montana Experiment Station reports *Sclerotium* blight (*S. fulvum*) to have been destructive to winter wheat at an altitude of about 5,000 ft. near Bozeman. The principal signs and symptoms are as follows: Killed leaves retain their normal shape as they lie prostrate on the soil; they are white, light gray, or tan, with numerous sclerotia visible therein; the sclerotia are 160μ–640μ in diameter and black in dry leaves but are as large as 1,200μ in diameter and yellow, orange, red, or brown in wet leaves; plants usually are killed, but those merely injured produce small heads and shriveled grain. In culture, *S. fulvum* grew only at about 0°–5° C., which explains why it causes wheat blight only under snowbanks, so that spring wheat escapes injury. *S. fulvum* killed many plants of 29 varieties of wheat. It also killed seedlings of *Thlaspi arvense* and produced sclerotia therein. The sclerotia of *S. fulvum* are produced within the wheat leaves. Natural decomposition of killed wheat plants liberates the sclerotia into the soil, where presumably they estivate. *S. fulvum* produced saprophytically numerous sclerotia on over-

wintered stems of wheat (*Triticum aestivum*), *Sisymbrium altissimum*, and *Chenopodium album*.

Fungi which cause decay of apples in cold storage, G. D. RUEHLE (*Wash. State Col., Res. Studies, 5 (1937), No. 2, pp. 99, 100*).—This contribution by the State College of Washington summarizes the results of a study involving 1,118 isolations from lesions developing on apples in cold storage. Of these, 2 Phycomycetes, 2 Ascomycetes, 36 Fungi Imperfecti, and 1 basidiomycete (all listed) were shown by inoculations to be capable of causing decay either at cold storage or higher temperatures. *Cephalosporium carpogenum*, *Sporotrichum carpogenum*, *Botrytis mali*, and *Cladosporium malorum* are listed (without description here) as new species. Blue mold decay was by far the most important type of rot encountered. Of the ten more or less distinct species or strains of *Penicillium* inducing this form of decay, *P. expansum* was the only one causing serious damage. A more or less definite succession of parasites appeared during the storage season.

The copper content of residues from sprays containing adjuvants, E. L. GREEN and M. C. GOLDSWORTHY (*Phytopathology, 27 (1937), No. 10, pp. 957–970*).—Kieffer pear trees were sprayed with five treatments containing copper phosphate as the fungicidal ingredient, all being alike except that a different adjuvant was added to each of four. Samples of fixed areas of the sprayed leaves of all plats were taken at appropriate intervals (May to October) and analyzed for total copper. For the determinations reported, a procedure described by Haas and Quayle (E. S. R., 73, p. 500), using 2/1,000 N sodium thiosulfate solution, proved suitable and convenient. In 1935, the copper per unit area was neither increased nor decreased by any of the adjuvants within the rather large error of sampling. The results indicate that all adjuvants tried increased the initial deposit of copper in 1936, and at least two measurably increased the adhesion. A fish-oil soap consistently gave the largest deposit of copper in the second year. The data on control of pear leaf blight (*Fabraea maculata*), for which the sprays were applied, were inconclusive, apparently because all the sprays applied were far more effective than necessary under the current weather conditions.

Twig lesions as a source of early spring infection by the pear scab organism, J. R. KIENHOLZ and L. CHILDS (*Jour. Agr. Res. [U. S.], 55 (1937), No. 9, pp. 667–681, figs. 6*).—Since 1932, infections by *Venturia pyrina* have become a serious factor for pear production in the Hood River Valley, Oregon. In this investigation by the U. S. D. A. Bureau of Plant Industry in cooperation with the Oregon Experiment Station, the primary infections appeared to correlate closely with the twig infections. The primary spring infections came largely from conidia in the overwintering pustules on the previous season's wood, and they were being dispersed before the bud tissues were exposed. Therefore, sprays should be timed by conidial dispersion from twig lesions, where these occur. Consistent and thorough spraying during the growing season largely prevented twig infections. The early season applications proved more important in this region for control of both twig and fruit scab, since more rain occurred at that time and a certain amount of host resistance became apparent later. Lime-sulfur was effective against active twig pustules, but could not be used on tender-skinned varieties after the young fruit was exposed, proving dangerous if applied after the bud scales had dropped. Applied in the late dormant stage, it reduced primary spore numbers to the extent that additional sprays gave satisfactory protection against reinfection. Environal factors were found to play an important role in natural control.

The epidemiology and control of cherry leaf spot, G. W. Keitt, E. C. Blodgett, E. E. Wilson, and R. O. Magie (*Wisconsin Sta. Res. Bul. 132 (1937), pp. 117, figs. 28*).—The *Coccomyces hiemalis* leaf spot is the most destructive disease of sour cherries in Wisconsin. The main work here reported has included field and laboratory studies of its development and control.

The cardinal temperature points for germination of conidia and ascospores are given, 16°–28° C. proving favorable. Continuous wetting was the most favorable of the moisture relations. While in their original matrix the conidia were resistant to desiccation and to direct sunlight, and they survived the winter on leaves kept in a meteorological instrument shelter.

The temperatures in the inoculation chamber expediting initiation of infection in potted Montmorency trees were, in decreasing order, 20°, 16°, 24°, 12°, 28°, and 8°, and most of the lesions became visible in 5–8 days at 20° or 28° and in 8–11 days at 12°. The amount of infection was much reduced when the moist period after inoculation was broken by air-drying periods. The amount of infection was not markedly influenced by modifications of "length of day" or light intensity, but prolonged darkness reduced the incidence. Very young leaves proved resistant, but mature leaves were highly susceptible. Lime-sulfur had minor and bordeaux mixture very little effectiveness in checking recently initiated infections.

The known freely infected hosts are *P. cerasus*, *P. avium*, *P. mahaleb*, and *P. pennsylvanica*, but certain other *Prunus* species have been infected experimentally. Isolates from the first three cross-infected freely on these hosts, but those from the first and last species did not do so on these two hosts. No wild host appears significant as a source of inoculum in Wisconsin. The only natural overwintering known is in dead leaves, and ascospores appear to be the only important primary inoculum in the State. The common fungicidal programs usually failed to prevent abundant overwintering. Ascospores usually matured before the new leaves became susceptible, and their discharge occurred only when the leaves were thoroughly wet or had begun to dry. Natural discharge (recorded for 16 seasons) usually began before the blossoming period and lasted about 6–7 weeks. Primary infection was comparatively sparse, and its chief role was to reestablish the fungus. Abundant conidial production followed infection under all conditions noted except at too high temperatures, and meteoric water was the chief agent for their dissemination. Secondary infection commonly occurred in successive "waves," rapidly becoming epidemic under favorable conditions. The critical period for leaf spot development and control began when the secondary inoculum became available, and continued until the leaves had fulfilled their functions.

As shown by control experiments (18 yr.), sanitation is an effective supplementary measure when feasible. Of the fungicides tested, bordeaux gave the best control, and lime-sulfur next, while none of the other sprays or dusts proved satisfactory. The usual timing of applications indicated for bordeaux is (1) just after petal-fall, (2) about 2 weeks later, and (3) just after harvest. With lime-sulfur, an additional application is given about 2 weeks after the second treatment. Of the bordeaux formulas tried none seemed better for general use than 3-4-50 (with high calcium hydrated lime). Lime-sulfur at 1-40 gave its best results. There was no indication that the standard bordeaux program causes any important dwarfing of the fruit. Bordeaux-sprayed fruit usually contained as much sugar and solids as the larger lime-sulfur sprayed or unsprayed fruit (often more), and there was little or no evidence of differences in pH or malic acid content of the expressed juices. Plats sprayed year after year with bordeaux showed substantial superiority in fruitfulness over

those sprayed with lime-sulfur, and had fewer winter-killed buds. Specific recommendations are made for Wisconsin orchards.

A bibliography of 116 titles is given.

Two Septoria leaf-spot diseases of Rubus in the United States, S. M. Zeller (*Phytopathology, 27 (1937), No. 10, pp. 1000–1005, figs. 2*).—The extreme differences in susceptibility of certain *Rubus* species and varieties to *Septoria* leaf spot in Oregon and to that found commonly in the Southeastern States brought to the attention of the Oregon Experiment Station the occurrence of two species on *Rubus* in America, viz, *S. rubi* and *S. brevispora* n. comb. (= *S. rubi brevispora*). Typically, *S. rubi* occurs in the Pacific Coast States and eastward. The distribution of *S. brevispora* needs further study, but collections have been made in Wisconsin, New York (type), Maryland, and North Carolina, and it is extremely active in the last three States. Most varieties of *R. occidentalis*, *R. strigosus*, and *R. idaeus* are susceptible to *S. brevispora* and resistant to *S. rubi*, while blackberry species are rather generally attacked by both. Diagnostic characteristics based on the leaf spots induced and on the imperfect stages are included for both fungi. There is some question as to the perfect stage of *S. rubi*, and that of *S. brevispora* has not been observed by the author.

***Armillaria mellea* Vahl ex Fr. on raspberries in British Columbia,** W. Jones (*Sci. Agr., 17 (1937), No. 12, pp. 752–753, pl. 1*).—During a survey of raspberry plantations (1936) many plants were found to be partially or wholly killed, and several thimbleberry plants (*Rubus parviflorus*) were similarly affected. Growing raspberries on newly cleared land is not to be recommended when this fungus is known to be present.

Effects of zinc on growth, H. S. Reed and E. R. Parker (*Calif. Citrogr., 22 (1937), No. 9, pp. 411, 412, fig. 1*).—Experiments by the California Citrus Experiment Station have shown that the efficiency of zinc treatments varies according to several conditions, e. g., the material used and its concentration, the methods of application, and the manner in which growth responds to the treatment. Furthermore, to avoid injury, it is necessary to use a spray containing relatively insoluble forms of zinc.

A brief account of the results of spray tests is presented to show as precisely as possible what happens to an orange shoot after the application of a zinc spray. The general results indicated that zinc was quickly absorbed by the tree and promptly affected the metabolism of the organs suffering from the mottle-leaf disease. The observations and measurements of stained sections are interpreted to mean that the improvement in general growth activities following treatment extends to the activity of the cambium and results in the production of more wood in the treated twigs. It is pointed out that this increased cambial activity would logically follow the great increase in chlorophyll-bearing area and the general improvement in the condition of the treated trees.

The toxic dose of mealy-bug wilt of pineapple, W. Carter (*Phytopathology, 27 (1937), No. 10, pp. 971–981*).—Four seasons' field experiments by the Hawaiian Pineapple Producers' Experiment Station with *Pseudococcus brevipes* are summarized. The localized wilt incidence in field plats was paralleled by a somewhat similar incidence of mealy bug establishment, but no explanation for the latter phenomenon is advanced. Single mealy bugs feeding for very short periods have produced wilt on rare occasions. Variability among the different experimental series was extremely high, but, in general, the percentage of plants wilting from infestation by mealy bug colonies of varying size increased with the number of mealy bugs. This increase was not directly proportional to the number of mealy bugs, there usually being a point on the dosage scale that

brought a disproportionate rise in wilt percentage. Increased dosages beyond this point resulted in only small increases in wilt percentage.

Flowers resistant to root-knot, J. R. WATSON (*Fla. Grower, 45 (1937), No. 8, p. 33*).—Of some 80 or more annuals recently tested by the Florida Experiment Station, 7 (marigold, coreopsis, argemone, *Rudbeckia bicolor*, *Ageratum* sp., evening primrose, and gaillardia) did not become infested, and 19 (listed) were only lightly affected. Culture of the first lot alone would tend to eliminate root knot from infested soil, whereas with the second lot enough nematodes would live over in the roots to carry on an infestation. Of the remaining annuals (also listed), 16 would usually make satisfactory growth and blossoms if given good care and sufficient water, 13 were only moderately affected, and the rest were more or less heavily infested.

The most satisfactory way to eliminate soil infestation is to grow only immune plants and keep out all other vegetation. *Crotalaria spectabilis* is one of the best species for this purpose.

Phytophthora crown rot of dogwood, D. B. CREAGER (*Jour. Arnold Arboretum, 18 (1937), No. 4, pp. 344–348, pl. 1*).—A disease responsible for the disfiguration and ultimate death of flowering dogwood trees (*Cornus florida*) on Long Island, N. Y., led the author to studies demonstrating *P. cactorum* to be the cause. Even though forms of this pathogen have been reported on members of at least 30 plant families, this is apparently the first report of its occurrence in the Cornaceae. The general nature and symptoms described for these diseases by various authors were strikingly comparable to those of the crown rot here described.

Twig blight of Asiatic chestnuts, especially that caused by Phomopsis, J. L. BEDWELL (*Phytopathology, 27 (1937), No. 12, pp. 1143–1151, figs. 2*).—Field studies of 112 forest plantations of Chinese (*Castanea mollissima*) and Japanese (*C. crenata* and *C. japonica*) chestnuts distributed throughout the eastern United States showed these exotic species to be susceptible to attack by several native die-back and canker-producing fungi, the following genera having been found associated: *Phomopsis*, *Sphaeropsis*, *Diplodina*, *Cytospora*, *Diplodia*, *Macrophoma*, *Fusicoccum*, *Dothiorella*, *Phoma*, and *Epicoccum*. Significant injury resulted particularly on poorer sites or at places where adverse climatic conditions had predisposed the trees to infection. In 1931 over 73 percent of the plantations were seriously affected, with many plantations having 90–100 percent of trees infected. The parasitism of *Phomopsis* sp., often found associated with twig blight, was proved by inoculations. The susceptibility was highest in trees that were dormant or practically so, and lowest in those that were in full leaf. The disease can be controlled if thrifty disease-free stock is planted on good sites, vigorous growth maintained, and injuries prevented.

Eradication of the Dutch elm disease (*Science, 86 (1937), No. 2239, p. 485*).—This is a digest of 1937 activities up to October in the campaign of eradication of the Dutch elm disease in the United States.

The anatomy of a black zone caused by Xylaria polymorpha, M. T. HILBORN (*Phytopathology, 27 (1937), No. 12, pp. 1177–1179, fig. 1*).—An anatomical study by the Maine Experiment Station of a black zone in red maple (*Acer rubrum*) caused by a root rot organism (*X. polymorpha*) indicated the zone line to be progressive in the host tissues. It is pointed out that the hyphal bladder cells forming the black zone are to be considered as a pseudosclerotium rather than as representing a more active stage in the fungus metabolism.

An occurrence of Sphaerotheca lanestris in Mexico, G. M. WATKINS and C. H. MULLER (*Amer. Midland Nat., 18 (1937), No. 4, pp. 659, 660, fig. 1*).—This note from the Texas Experiment Station and the University of Illinois reports

The parasitism of Polyporus schweinitzii on seedling Pinus strobus, R. E. WEAN (*Phytopathology*, 27 (1937), No. 12, pp. 1124–1142, figs. 8).—*Polyporus schweinitzii*, commonly known to cause a root and root-crown decay of mature and overmature coniferous trees, has hitherto been thought to attack the trees by invasion of the roots through wounds. In 1933 this fungus was discovered causing a very severe root rot in sapling white pines in New York State. Sand culture experiments involving five nutritional conditions not only elucidated the normal and abnormal metabolism of white pine, but showed that 1- and 2-year-old seedlings under phosphorus deficiency were highly susceptible and that when the nutrient solution was adjusted toward alkalinity (pH 6.0 or 7.0) the roots also were severely injured by the fungus. For the first time, this fungus has been demonstrated to be a primary parasite capable of penetrating directly through the living cortical cells of the roots. The host-parasite relations are discussed in detail. Chemical analyses of the ash of infected trees indicated a lower calcium content than for normal trees, and *P. schweinitzii* was found capable of rendering the calcium nonavailable to the seedlings. The physiology of the fungus was studied in various media. In liquid cultures it produced an acid capable of increasing the acidity of nonbuffered solutions. In buffered solutions the optimum point for growth was pH 4.0. The parasitism on living roots of seedlings indicates the possibility of this fungus being spread by nursery stock to forest plantings, and, further, that it is a factor influencing the natural reproduction of susceptible host species.

A bibliography of 34 references is included.

A preliminary report on frenching of tung trees, W. REUTHER and R. D. DICKEY (*Florida Sta. Bul. 318* (1937), pp. 21, figs. 9).—The name "frenching" is suggested for the type of partial chlorosis and necrosis of tung tree (*Aleurites fordi*) foliage described. A preliminary survey (1937) indicated 5–10 percent of the trees in commercial plantings to have the symptoms in some degree. Data presented strongly suggest that control can be effected by manganese sulfate treatment. No definite recommendations for control measures are made, but tentative suggestions for treatment in an experimental way are outlined.

The toxic symptoms probably produced by excess soluble manganese in the soil are described. Certain data presented indicate that frenching of tung trees is not confined to any particular soil series or narrow range of soil reaction, but is correlated with the exchangeable manganese content of the soil.

Preservative treatment of green southern yellow-pine lumber with zinc chloride and zinc chloride-sodium bichromate, E. R. BOLLER (*Amer. Wood-Preservers' Assoc. Proc.*, 33 (1937), pp. 262–278, figs. 3).—The results of this study indicated that southern yellow pine can be satisfactorily impregnated with zinc chloride-sodium bichromate or zinc chloride alone by conditioning with steam or water at 260° F., subjection to vacuum and pressure, and treatment with a 5-percent solution of preservative at 165°. Green pine was heated somewhat more rapidly by water than by steam. Green pine was also satisfactorily treated with zinc chloride in a somewhat shorter time by conditioning with the treating solution at 260°, subjection to vacuum and pressure, and treatment with a 5-percent solution of the salt at 220°–260°. A fairly satisfactory treatment with this salt was obtained without use of vacuum following the conditioning period. By a final vacuum application the moisture content of the treated green wood was appreciably lowered. Generally, treatment reduced the moisture content when it was initially high and raised it when the initial content was relatively low. Treatment of green pine had no effect on its behavior in kiln-drying or on its subsequent important strength properties.

There was some indication that treatment would reduce deterioration when dried under adverse conditions.

Temperatures necessary to kill fungi in wood, M. S. CHIDESTER (*Amer. Wood-Preservers' Assoc. Proc., 33 (1937), pp. 316–324, figs. 3*).—The results obtained from heating sticks infected with *Lentinus lepideus, Lenzites sepiaria,* or *Poria incrassata* indicated that any of them will be killed if the temperature in the wood is maintained for 60 min. at 150° F., 30 min. at 170°, 20 min. at 180°, 10 min. at 200°, or 5 min. at 212°, providing the moisture content of the wood remains above fiber saturation during treatment. This condition will exist so long as the medium through which heat is applied at the wood surface (e. g., steam or oil) allows little water loss. Higher temperatures or longer exposures than those noted will be required to kill fungi within wood when conditions surrounding it allow the wood to dry out during treatment. The data given make it possible to select heating periods sufficient to sterilize either round or sawed timbers under the treating conditions employed.

The methods used in this study are described in detail.

Some hyphomycetes that prey on free-living terricolous nematodes, C. DRECHSLER (*Mycologia, 29 (1937), No. 4, pp. 447–552, figs. 18*).—Among other fungi described in this monographic study are four new species of *Arthrobotrys,* seven of *Dactylella,* two of *Dactylaria,* and one each of *Tripospormia* and *Trichothecium.*

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1937, I. N. GABRIELSON (*U. S. Dept. Agr., Bur. Biol. Survey Rpt., 1937, pp. 63*).—The work of the year dealt with (E. S. R., 76, p. 500) includes the status and management of wildlife, namely, waterfowl, forest and range fauna, banding of game and other birds, bird distribution, and biological research on refuges area and in Alaska; economic studies of wildlife, including waterfowl food, mosquito control in wildlife habitat, food habits, and field investigations of injurious species; fur animal research, including fur farming, fur research, work at the Fur Animal Experiment Station in the Adirondack section with foxes, minks, and martens, and at the Rabbit Experiment Station at Fontana, Calif., with foods, feeding, and breeding experiments; research in disease control, including the relationship of domestic stock and wildlife, pollution problems, and infections of fur animals; migratory waterfowl restoration; wildlife refuges; predatory and other injurious animals control; research on control methods; and miscellaneous administrative data.

Animal biology, M. F. GUYER (*New York and London: Harper & Bros., 1937, rev. ed., pp. XX+735, figs. 422*).—A work presented in 6 parts and 28 chapters.

Feeding wildlife in winter, W. B. GRANGE (*U. S. Dept. Agr., Farmers' Bul. 1783 (1937), pp. II+21, figs. 9*).—This is a revision of and supersedes Miscellaneous Publication 159 (E. S. R., 70, p. 202).

The contents of owl pellets as indicators of habitat preferences of small mammals, L. D. WOOSTER (*Kans. Acad. Sci. Trans., 39 (1936), pp. 395–397*).—The results of analyses of the pellets of barn owls (*Tyto alba pratincola*), gathered from four nests from widely scattered areas and quite different environments, are presented in two tables.

Fur-bearing mammals of California: Their natural history, systematic status, and relations to man, I, II, J. GRINNELL, J. S. DIXON, and J. M. LINSDALE (*Berkeley: Univ. Calif. Press, 1937, vols. 1, pp. XII+375, pls. 7, figs. 138; 2, pp. XIV+377–777, pls. 6, figs. 206*).—This contribution from the Museum of Vertebrate Zoology, University of California, is based upon the mass of ma-

terials accumulated in the museum collection, with manuscript field notes and correspondence covering a period of 25 yr., and the reports of licensed trappers of the State for several years and other records furnished by the State Fish and Game Commission. A five-page list of references to the literature cited is included.

Late summer and early fall foods of the red fox in central Massachusetts, W. J. HAMILTON, JR., N. W. HOSLEY, and A. E. MACGREGOR (*Jour. Mammal., 18 (1937), No. 3, pp. 366, 367*).—The midsummer food of the red fox as indicated by 131 scats and the fall food as indicated by 36 scats are reported upon, the details being given in table form.

Some effects of altitude and latitude on the Columbian ground squirrel, A. W. MOORE (*Jour. Mammal., 18 (1937), No. 3, pp. 368, 369*).—Breeding and weight records of the Columbian ground squirrel (*Citellus columbianus columbianus*), obtained at five elevations in Montana during the year 1933, are reported upon in table form. The data indicate that there may be an optimum elevation for the development of this ground squirrel, the lowest percentage of barren adult females, the largest litters, and the largest squirrels having occurred at a 4,500-ft. elevation.

The breeding season of the muskrat in northwest Iowa, P. L. ERRINGTON (*Jour. Mammal., 18 (1937), No. 3, pp. 333–337*).—Contributing from the Iowa Experiment Station, a résumé of certain data obtained in connection with recent field studies conducted chiefly at lakes near Ruthven is presented. The data obtained indicate that the period of gestation of muskrats may vary from a probably atypical minimum of near 19 days to a probably more usual minimum of 22 or 23 days, with the ordinary period probably around 30 days.

The Maryland muskrat marshes, V. BAILEY (*Jour. Mammal., 18 (1937), No. 3, pp. 350–354, figs. 4*).—An account of the muskrat industry in Maryland.

Bird behaviour, F. B. KIRKMAN (*London: T. Nelson & Sons, 1937, pp. XV+17–232, pls. 30, figs. 6*).—This contribution is based chiefly on a study of the black-headed gull.

The A B C of attracting birds, A. M. PETERSON (*New York: Bruce Pub. Co., 1937, pp. [7]+146, [figs. 60]*).—A practical guide.

A glossary of entomology, J. R. DE LA TORRE-BUENO (*Brooklyn, N. Y.: Brooklyn Ent. Soc., 1937, pp. IX+336, pls. 9*).—A new work, based on An Explanation of Terms Used in Entomology, by J. B. Smith, published in 1906.

Entoma: A directory of insect pest control, edited by C. C. HAMILTON (*New Brunswick, N. J.: Thatcher-Anderson Co., 1937, pp. [2]+144*).—A revision of this directory (E. S. R., 73, p. 647).

Two methods for measuring egestion time from large insects, B. T. SNIPES, O. E. TAUBER, and H. GUNDERSON (*Iowa State Col. Jour. Sci., 11 (1937), No. 3, pp. 253–257, figs. 4*).—Descriptions are given of two methods. "Insects are confined in special cages above a moving calibrated surface which consists either of a revolving disk turned by kymograph clockworks, or a continuous belt of paper supported by two horizontal cylinders, one of which is powered by a geared-down electric motor. Preparatory methods of feeding test animals are given. Suggestions are listed for varying the cages for different species of insects and for increasing the carrying capacity of the mechanisms. Four figures showing details of construction are included."

[**Notes on economic insects and their control**] (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 967–972*).—The notes presented (E. S. R., 78, p. 362) are as follows: Termites [*Reticulitermes flavipes* Kol.] Infesting Turnips, by M. R. Osburn (p. 967); Notes on the Grape Leaf Folder and Its Parasites in the San Joaquin Valley, by H. C. Donohoe and G. H. Kaloostian (pp. 967, 968); Sodium

Lauryl Sulfate as a Contact Spray (p. 968) and Sweet Potato Root Weevil [Sweetpotato Weevil] Overwinters as Adult in Louisiana (p. 968), both by H. L. Dozier; *Tyroglyphus longior* Gerv. on Cultivated Mushrooms, by A. C. Davis (pp. 968, 969); Rose Leaf Beetle in Pennsylvania, by M. Wood and H. N. Worthley (pp. 969, 970) (Pa. Experiment Station); Starvation of Developing Parasites as an Explanation of Immunity, by S. E. Flanders (pp. 970, 971) (Calif. Citrus Station); Food Plants of *Nodonota puncticollis* Say, by H. M. Steiner and P. J. Chapman (pp. 971, 972) (N. Y. State Station); and Leafhoppers and Homoptera of Related Families Collected in and Adjacent to Narcissus Plantings, by F. S. Blanton (p. 972).

Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1937, L. A. Strong (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1937, pp. 3–17, 19–29, 38–43, 48–84*).—The work of the year (E. S. R., 76, p. 654) with fruit and nut insects included codling moth control with insecticides and parasites; biology and seasonal history of the pear thrips in the Northwest; oriental fruit moth control by parasites; peach borer, plum curculio, grape berry moth, grape rootworm, pecan nut casebearer, obscure scale in northern Louisiana, and May beetle (*Phyllophaga* spp.) control by insecticides; hickory shuckworm on pecan; grape leafhopper reduction by burning over areas surrounding the vineyard; raisin moth control by cover protection; California red scale control by fumigation; Japanese beetle and Asiatic beetle control with insecticides and parasites; and Mexican fruitfly control by traps.

Insects affecting forest and shade trees referred to included bark beetles, white grubs in nurseries and plantations, bark beetles as vectors of Dutch elm disease, species of *Matsucoccus* on pine, and gypsy and brown-tail moths.

Cereal and forage insect investigations dealt with include the European corn borer, hessian fly, chinch bug, armyworm, corn flea beetle, pea aphid, alfalfa weevil, potato leafhopper on peanuts, sugarcane borer, the green bug as a vector of mosaic disease of sugarcane in Louisiana, sugarcane beetle, West Indian cane fulgorid *Saccharosydne saccharivora* Westw. in Florida, fumigation for stored grain insects, grasshoppers, and the Mormon cricket.

Truck crop, garden, berry, tobacco, greenhouse, and mushroom insects reported upon include wireworms (the sugar beet wireworm, the Pacific coast wireworm, and the Gulf wireworm); the Mexican bean beetle; pea weevil; pea aphid; corn earworm on lima beans; tomato pinworm; tomato fruitworm (the corn earworm); vegetable weevil; pepper weevil; mole crickets (*Scapteriscus* spp.); looping caterpillar (*Autographa* spp.); the beet armyworm; cutworms; the European earwig; cabbageworms (the cabbage looper, the imported cabbageworm, and the diamondback moth); the raspberry fruitworm; red berry mite *Eriophyes essigi* Hass.; beet leafhopper; tobacco flea beetles (the tobacco flea beetle and the potato flea beetle); tobacco hornworms (*Protoparce* spp.); the gladiolus thrips; common red spider on greenhouse-grown lima beans and sweetclover; and mushroom flies (*Sciara* spp.), sowbugs, mites (*Tyroglypha* spp.), and springtails (*Lepidocyrtus* spp. and *Achorutes* spp.) on mushrooms.

Cotton insects mentioned are the bollweevil, cotton flea hopper, pink bollworm, cotton leaf worm, thrips, stinkbugs (*Euschistus impictiventris* Stål, Say's stinkbug, and *Thyanta custator* F.), and the Thurberia weevil.

Data on bees relate to nutrition, honey plants, resistance to foulbrood, lethal effect of arsenicals, and breeding.

Work with insects affecting man and animals considered included screwworms and other blowflies (*Phormia* spp.), cattle grubs, cattle and horse lice, goat lice, fly sprays and repellents, the sheep tick, the American dog tick, the southern cattle tick *Boophilus annulatus australis* Fuller in Puerto Rico, the

larder beetle and other household and stored-product insects, mosquitoes, sand flies, surgical maggots, and fire ants (*Solenopsis* spp.).

Insecticide and related studies under way include tests of many organic and plant products; tartar emetic as a spray for citrus; application of concentrated mixtures by autogiro; nicotine as a fumigant; digestion and absorption in the southern armyworm as relates to pyrethrum and other insecticides; methyl bromide as a fumigant; low temperature treatment of grapes for the Mediterranean fruitfly; chemical investigations on (1) insecticidal plants (tobacco, derris, pyrethrum, etc.) and their constituents, (2) the development of synthetic organic insecticides, (3) the removal of spray residue, (4) the development of inorganic insecticides, (5) fumigants for control of insect pests, (6) oils and oil emulsions, (7) accessory materials for use with insecticides, and (8) the determination of the toxicity of new insecticidal compounds by the use of goldfish.

[Work in entomology by the Colorado Station] (*Colorado Sta. Rpt. 1937, pp. 27–31*).—The work of the year briefly reviewed (E. S. R., 76, p. 501) relates to psyllids in relation to potatoes and sprayer efficiency in control of psyllids and other potato insects, both by L. B. Daniels; control of the imported cabbageworm, the cabbage looper, the diamondback moth, the Mexican bean beetle and cherry slug, and the tomato psyllid; insect vectors of peach mosaic, by Daniels; Syrphidae of the State in relation to plant louse control; squash insects (the squash bug, cucumber beetle, the Mexican bean beetle, and thrips), by J. L. Hoerner; and general insect pests, including grasshoppers (the differential grasshopper, the two-striped grasshopper, and *Dissosteira longipennis*), the snowy tree cricket, tussock moths (*Hemerocampa* sp. (?) and the Douglas fir tussock moth), the Mormon cricket, the straw itch mite, the pigeon tremex, termites (*Reticulitermes flavipes* (?) Koller), and the European earwig.

[Work in entomology by the Georgia Station] (*Georgia Sta. Rpt. 1937, pp. 46–51, figs. 2*).—Reference made to the work of the year (E. S. R., 76, p. 358) includes that with the cowpea curculio, green bug, corn earworm in tomatoes, Mexican bean beetle, and vegetable weevil.

The fifth annual summary of the population of the more important insects in Kansas, covering the year 1935, R. C. SMITH and E. G. KELLY (*Kans. Acad. Sci. Trans., 39 (1936), pp. 129–149, figs. 3*).—The details of this annual summary (E. S. R., 76, p. 214), contributed from the Kansas Experiment Station, are presented in table and graph form.

[Work in entomology by the New York State Station] (*New York State Sta. Rpt. 1937, pp. 32, 40–53*).—Work with insect pests and their control (E. S. R., 76, p. 656) included studies of calcium arsenate, the codling moth, lead arsenate substitutes, sulfur in summer sprays, stickers and spreaders, the treehopper *Glossonotus crataegi* Fitch as a pest of the apple, responses of the codling moth to light, insecticides used as dormant and early spring treatment; fruit insect work in eastern New York, including spray residue on apple, the codling moth, apple maggot, scurfy scale, roundheaded apple tree borer, white apple leafhopper, and the gooseberry fruitworm; biological control investigations of the oriental fruit moth and the peach borer; studies of the pine needle scale, strawberry root weevil, and spruce needle miners (*Olethreutes abietana* Fern. and *Recurvaria piceaella* Kearf.); pea aphid control; and vegetable insects on Long Island, including cabbage insects, the Mexican bean beetle, and the corn earworm.

Some insects and their food-plants in Sierra Leone, E. HARGREAVES (*Bul. Ent. Res., 28 (1937), No. 3, pp. 505–520*).—A systematically arranged list of insects and their food plants in Sierra Leone is presented.

Annotated list of insects injurious to native food crops in Tanganyika, W. V. Harris (*Bul. Ent. Res., 28 (1937), No. 3, pp. 483–488*).—An annotated list of the insects injurious to native food crops in Tanganyika arranged in systematic order is presented.

Controlling insect pests of melons, cucumbers, and related crops, L. Haseman (*Missouri Sta. Bul. 391 (1937), pp. 19, figs. 6*).—A brief account is given of the striped cucumber beetle, spotted cucumber beetle, squash bug, melon aphid, squash borer, pickleworm, and melon worm, which have proved most injurious to melons, cucumbers, and related crops in Missouri, with means for their control, and notes on minor insects and non-insect pests.

Controlling Colorado potato pests, L. B. Daniels (*Colorado Sta. Bul. 437 (1937), pp. 35, figs. 17*).—The three major insect pests of potatoes in Colorado are, in the order of their importance, the potato psyllid *Paratrioza cockerelli* Sulc., the potato flea beetle, and the Colorado potato beetle. Summary accounts of their occurrence, importance, biology and habits, and means of control are given, as well as information on spraying and dusting machinery.

An annotated list of insects found in the bark and wood of Ulmus americana L. in New York State, L. L. Pechuman (*Bul. Brooklyn Ent. Soc., 32 (1937), No. 1, pp. 8–21*).—Observations made by members of the Dutch elm disease investigation staff at Cornell University on the various species of insects found in elm, with especial reference to their potential ability to transmit the organism of the Dutch elm disease, have been compiled and are presented as an annotated list, systematically arranged.

Root aphids and ants affecting rubber-producing plants, M. S. Ghilarov (*Bul. Ent. Res., 28 (1937), No. 3, pp. 479–482, fig. 1*).—Aphids found on the roots of rubber-producing plants in the Ukraine and here considered are *Trifidaphis phaseoli* Pass., *Trama troglodytes* Heyd., *Aphis plantaginis* Schrk., and *Xerophilaphis scorzonerae* Mordv.

[Household insects and their control], E. A. Back (*U. S. Dept. Agr. Leaflets 144 (1937), pp. 6, figs. 5; 147, pp. 8, figs. 5; 149, pp. 4, figs. 3*).—Practical accounts are given on cockroaches, house ants, and silverfish, respectively, and their control.

Uses of insect-electrocuting light traps, W. B. Herms and J. K. Ellsworth (*C. R. E. A. News Letter [Chicago], No. 15 (1937), pp. 25–29, figs. 8*).—This is a brief contribution from the California Experiment Station in which the progress results are briefly presented of studies on the development of insect-electrocuting light traps in California. It is pointed out that one of the principal objectives of this investigation is to develop a control of insect pests which will obviate poisonous residues. Data are given briefly on the control of the grape leafhopper, artichoke plume moth, codling moth, insects of tomatoes, mushrooms, and dried fruit, and the lima bean pod borer.

Factors concerned in the deposit of sprays.—III, Effects of wetting and emulsifying powers of spreaders, Y. Ben-Amotz and W. M. Hoskins (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 879–886, figs. 3*).—In continuation of the work noted (E. S. R., 75, p. 224), the authors report having found that a "deposit of oil obtained upon a standard beeswax surface from a fixed volume of an emulsion containing the protein spreaders hemoglobin or blood albumin, increases as small amounts of the spreaders are added, reaches a maximum at a concentration characteristic for each, and decreases as larger amounts are used. On the other hand, all emulsions containing the soap-sodium oleate deposit less oil than the mechanical mixture of oil and water. These different behaviors are explained on the basis that deposit is favored by an increase in wetting power until the latter is so great that much of the surface is con-

tinually covered during the application. Wetting power must be studied by dynamic methods, for static measurements are misleading. Emulsifying power always *decreases deposit. Application of these conceptions explains the two types of deposit curves.* It is believed that a maximum will be obtained at some intermediate concentration of all typical wetting agents, and that all typical emulsifiers will decrease deposit at all concentrations."

New wetting and spreading agent for spray materials, G. L. WALKER (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 962–967*).—A report is made of work conducted jointly by the Crop Protection Institute and the Connecticut [New Haven] Experiment Station.

It was found that "a sodium salt of water-soluble petroleum oil sulfonates designated as Ultrawet possesses desirable qualities as a wetting and spreading agent for spray materials. Ultrawet at 1:1,600 in water did not damage the foliage of many economic plants. Ultrawet is compatible with the insecticides and fungicides in common use. The addition of Ultrawet to cube dust resulted in increased control of the potato flea beetle. The addition of Ultrawet to cube root in sprays gave promising results in controlling onion thrips. The use of Ultrawet with cube root in sprays to control the European corn borer gave slightly increased protection. Ultrawet combined with half the ordinary strength of dry lime-sulfur controlled apple scab nearly as well as full strength dry lime-sulfur and reduced injury to foliage caused by the lime-sulfur-arsenate of lead combination. Ultrawet added to sprays and dusts to control the Mexican bean beetle, striped cucumber beetle, imported cabbage worm, and cabbage looper did not provide increased protection."

Improvements in determination of oil deposit on sprayed foliage, L. H. DAWSEY and J. HILEY (*Jour. Agr. Res. [U. S.], 55 (1937), No. 9, pp. 693–701*).—An improved weighing method for the determination of oil deposit on chrysanthemum foliage after spraying with emulsions is described. The method is said to be applicable to nearly all kinds of nonvolatile insecticidal oils, including both petroleum oils and fatty oils. The procedure consists of four steps: (1) Cutting leaf disks in preparation of samples, (2) extracting samples, (3) evaporating the solvent, and (4) drying residues to constant weight. Recovery of oil from chrysanthemum foliage is 100 percent.

"Petroleum ether was found to be the most suitable solvent to use in extraction, because it dissolved smaller quantities of the natural plant substances present on the foliage than other solvents tested. All the oil could not be extracted by simply washing disks a limited number of times, but when samples contained freshly cut disks and extraction was carried out in a standard type of apparatus for 2 hr. recovery was complete. Drying and grinding of the foliage before extraction was not necessary for complete recovery of deposit even 6 days after spray application.

"The accuracy attainable by the method is influenced by the variation in quantities of natural leaf substances extracted from the same number of leaf disks, from sample to sample, and depends upon the size of the oil deposit being measured as compared with the quantity of leaf substances present. The error in calculating low deposits is larger than the error in calculating high deposits. With average-sized and higher oil deposits the error in analysis is small and may be neglected, since very large differences, due to the coverage factor in spraying, obscure any errors detectable by the method of analysis when used in actual practice."

Some physical properties of commercial paris greens, L. D. GOODHUE and E. L. GOODEN (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 913–917, figs. 2*).—The

authors report upon the particle-size distribution of nine commercial samples of paris green as determined by sedimentation analysis.

"Except for one air-floated sample, the paris greens were found to be coarser than the samples of calcium arsenate studied in a previous investigation [E. S. R., 77, p. 509]. The particle form is indicated in photomicrographs, which also gave a check on the particle size as determined by sedimentation analysis. The loose bulking values were in approximately the same order as the results by sedimentation and may be used as a rough measure of the fineness of paris green. The angle of slope indicates that in general paris green will flow easily and dust well. The density of each sample was determined to check the purity of the samples and to obtain some idea of the uniformity of the different brands. Little variation in density was noted."

Homologs of paris green. IV, Insecticides prepared from animal and vegetable oils, F. E. DEARBORN (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 958–962*).—In this further contribution (E. S. R., 77, p. 68) it is shown that "insecticides, homologs of paris green, can be prepared from oils of vegetable or animal origin. The products are bluish green, insoluble in water, and after once dried are not easily wet by water without the use of a wetting agent, such as alcohol. Addition of a solution of bone glue or gelatin to a water suspension of the insecticides improves the quality of the suspension and tends to reduce the amount of hydrolysis of the compounds. These insecticides can be ground to a very fine state of subdivision, producing a light, fluffy product."

The substitution of nicotine for mineral insecticides, W. MOORE (*Va. Acad. Sci. Proc., 1934, p. 37*).—This is an abstract of a contribution on the substitution of nicotine for mineral insecticides.

Toxicity of a number of insecticides to three cotton insects, G. L. SMITH and A. L. SCALES (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 864–869*).—Cage tests of the toxicity of various insecticides and mixtures of insecticides at Tallulah, La., during the summer of 1936 and field tests later of promising insecticides and combinations are reported, the details being given in five tables.

Applied against the bollweevil, calcium arsenate was more effective than any of the insecticides tested with the exception of cube (4.9 percent rotenone), paris green, and mixtures of calcium arsenate-paris green. Against the cotton leaf worm calcium arsenate caused about the same mortality as pyrethrum (0.76 percent total pyrethrins), paris green, or mixtures of calcium arsenate-paris green. Against nymphs and adults of the tarnished plant bug pyrethrum (0.76 percent pyrethrins) and paris green caused the highest mortalities. Pyrethrum and pyrethrum mixtures with sulfur, paris green, and cube are regarded as promising insecticides against this insect.

Tolerance of animals to pyrethrum extracts, E. R. DE ONG (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 921–927, fig. 1*).—Experiments in which very great excesses of pyrethrum spray were fed to sheep proved conclusively the harmlessness of such a mixture to feeding lambs and pregnant ewes and to the lambs born to such ewes.

Housefly age as a factor in susceptibility to pyrethrum sprays, W. A. SIMANTON and A. C. MILLER (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 917–921, fig. 1*).—Report is made of a study undertaken to determine the susceptibility of the housefly at various ages to a pyrethrum fly spray.

"The data show that very young houseflies are more easily paralyzed but less easily killed than are older flies. By the Peet-Grady method [E. S. R., 66, p. 161] female flies are about twice as difficult to kill as are male flies. Female flies are also more difficult to paralyze. There are indications that both resistance and uniformity of resistance are closely associated with reproductive activity."

Ground cornstalks and cobs as base materials and magnesium sulphate and sodium fluosilicate as poisons in grasshopper baits, R. ROBERTS (*Nebraska Sta. Bul. 312 (1937), pp. 14*).—The scarcity and high cost of bran having made necessary the use of emergency substitute bases in grasshopper baits, four unmixed bait bases were experimented with, (1) coarse flaked wheat bran (shorts free), used as a standard, (2) sawdust, (3) ground cornstalks, and (4) ground corncobs, as well as a combination of the three latter materials with a mill-run bran. The combination bait consisting of seven parts of cornstalks and one part of mill-run bran as a base proved to be second to the coarse flaked wheat bran in effectiveness.

"The cornstalks and cobs were ground into small particles by running them through a hammer mill. The corncobs and bran combination proved to be third in effectiveness, but the greater availability of the cornstalks makes their use superior to that of corncobs in the same proportions. Their obviously better properties for making a bait (lighter weight, greater absorptiveness, etc.) are also in their favor. These experiments show that ground cornstalks cannot wholly replace bran as an effective grasshopper bait base; therefore, ground cornstalks are not being recommended as a complete substitute for bran. It is believed that at normal prices bran used pure would be the most satisfactory material.

"In other experiments conducted to check reports of the effectiveness of magnesium sulfate and sodium fluosilicate as substitutes for arsenicals in grasshopper baits, magnesium sulfate proved to be ineffective, and sodium fluosilicate at a strength of 3 percent by weight proved to be as effective as a 5 percent preparation of the same material, in a pure cornstalk base. Both of the latter baits killed 89 percent of the grasshoppers offered these baits in the cage experiment."

Problem of the range grasshopper, E. D. BALL (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 904–910*).—This further contribution (E. S. R., 76, p. 68) is a general discussion of the range grasshopper problem.

A grasshopper survey for eastern Kansas, 1936, L. C. WOODRUFF (*Jour. Kans. Ent. Soc., 10 (1937), No. 3, pp. 75–83*).—In determining the grasshopper population of eastern Kansas during the season of 1936, repeated collections were made in typical habitats and the relative abundance of 15 species recorded. A fairly distinct fauna was found to be characteristic of the prairie grasses as compared with the cultivated crops. Actual injury to the native grasses was slight.

The principal injurious species all belonged to the genus *Melanoplus*. *M. mexicanus* was of only minor importance, while its migratory phase, the Rocky Mountain grasshopper, was not observed. The red-legged grasshopper was the outstanding pest of alfalfa but was also abundant elsewhere. The differential grasshopper and the two-striped grasshopper were slightly less abundant than the red-legged grasshopper, but due to their larger size and more voracious feeding were probably of nearly equal importance.

Notes on the development of red locust hoppers (Nomadacris septemfasciata Serv.) under natural climatic conditions, C. SMEE (*Bul. Ent. Res., 28 (1937), No. 3, pp. 417–427, figs. 9*).—This is a report of observations made in the Nyasaland Protectorate.

Thrips damage to cotton, E. W. DUNNAM and J. C. CLARK (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 855–857*).—The results of a study made of injury by thrips in experimental plats of cotton at Stoneville, Miss., during the spring of 1936, in which the flower thrips, the tobacco thrips, *Frankliniella runneri* Morg., and *Sericothrips variabilis* Beach contributed to the damage, are reported. In the

course of observations of 40 varieties of cotton it was found that early chopping and allowing a greater number of stalks to the hill decreased the percentage of terminal bud damage. No difference in varietal infestation was observed under the conditions of the experiment.

"The average boll crop for all varieties was reduced 7.72 percent and was set from 10 days to 2 weeks later on the damaged plants than on the normal plants. The average loss of 13.38 percent in seed cotton showed that there was also a decrease in the size of bolls produced by the damaged plants. Destruction of the terminal buds caused a loss in seed cotton production in 34 of the 40 varieties. Commercial classification of the lint showed a loss in staple length on damaged plants of 7 varieties."

Reduction of cotton yield by thrips, J. G. Watts (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 860–863*).—Observations of injury to cotton by thrips, conducted by the South Carolina Experiment Station at Florence, are reported.

In a heavily infested experimental field there were white blossoms on the normal stalks on 50 days but for only 42 days on thrips-injured stalks. The reduced vitality, together with delay in fruiting, resulted in the injured series opening only 65 percent as many blossoms as the uninjured and producing only 60 percent as many mature bolls. Since 56 percent of the terminal buds had been killed in the seedling stage, as determined from a count of approximately 9,000 plants from 200 ft. of row at each of 30 points in the field, it is concluded that 56 percent of the plants in this field would have produced approximately 40 percent more cotton in the absence of thrips injury.

Species of thrips found on cotton in South Carolina, J. G. Watts (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 857–860*).—In this contribution from the South Carolina Experiment Station notes are presented on 13 species of thrips, representing 10 genera belonging to 3 families and 2 suborders and found on cotton in South Carolina.

The composite thrips Microcephalothrips abdominalis (Crawford), S. F. Bailey (*Canad. Ent., 69 (1937), No. 6, pp. 121–126, figs. 2*).—This contribution deals with the structure, synonymy, and biology of the composite thrips, which is very common at Davis and Sacramento, Calif., in zinnia, marigold, and calendula flowers. It has been observed to be injurious to flower seeds, particularly those with a thin coat.

The iris thrips and its control by hot water, with notes on other treatments, F. F. Smith and L. G. Utter (*U. S. Dept. Agr. Circ. 445 (1937), pp. 12, figs. 6*).—The economic importance and injury, seasonal history, macropterous forms, dissemination, habits, original host and home, effect of cultural practices, and control of the iris thrips are considered. This primary pest of iris was first described in 1924 by Watson (E. S. R., 53, p. 52), it having been intercepted on iris from Europe. Though not known to occur on established plantings in the United States until discovered in 1931 on Japanese iris at Hamburg, N. Y., as reported by Smith in 1933 (E. S. R., 69, p. 824), it has spread and now occurs in at least 10 States.

The foliage and leaf sheaths of many types of iris show a rusty or blackened injury, while on Japanese iris flower bracts and petals may be affected. The winter is passed by the adult female in the crown of the host, oviposition commencing late in April and the first offspring reaching maturity late in May. Development of generations continues until the latter part of October. Most adults are wingless, but macropterous females appeared with the first generation and were present during the summer and early part of the fall. Migration apparently occurs chiefly in June when winged forms are most abundant.

"Cultural practices such as burning off old foliage during winter or flooding the plants during the growing season did not control the thrips. The thrips may be killed on plants that have been lifted and freed of soil by immersing them for 30 min. in water at 110° F.; or, on plants in beds, by flooding with water maintained at the desired temperature and confined in a cylinder pressed into the ground around the plant. Japanese irises are preferably treated in the spring, but are also satisfactorily treated late in the summer or in the fall provided that newly set plants are regularly watered. Spring transplanting and treatment were disastrous to bearded irises, southern types of iris, and certain miscellaneous species, but treatments of these groups late in the summer or in the fall were successful.

"In preliminary tests with insecticides and fumigants, a spray containing derris powder (0.025 percent of rotenone) and sulfonated castor oil (1 to 400) gave a high degree of control, as did also repeated 1-hr. fumigations in which tobacco powder was burned beneath a paper tent."

Winter mortality of chinch bugs in Iowa, G. C. Decker and F. Andre (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 927–934, figs. 3*).—A further report (E. S. R., 76, p. 829) of a study made during the winter of 1934–35 is contributed from the Iowa Experiment Station. An unusually high winter mortality reduced the chinch bug population over a wide area in central and southwestern Iowa.

Tracing long-distance movements of beet leafhopper in the desert, H. E. Dorst and E. W. Davis (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 948–954, figs. 3*).—An account is given of tracing long-distance movements of the beet leafhopper by the plat method, which provides for the establishment of small plats of host plants on the desert. "The dispersal is over the desert in which these plats are located. The plants are irrigated in the fall and maintained in a growing condition so that early in the spring they are growing vigorously and are of suitable size to be sampled for migrating leafhoppers. The plats are located in the vicinity of some residence so that collections may be conveniently made each day. This method is applicable in tracing long-distance movements over deserts that naturally do not have host plants or other suitable plants on which dispersals could be detected. Four years' data obtained by this method verify earlier deductions that the spring movement of the beet leafhopper into the central Utah beet-growing section originates in the lower Virgin River Basin."

Leafhoppers found on cotton, R. K. Fletcher (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 863, 864*).—Observations of leafhoppers occurring on cotton, made by the Texas Experiment Station in the vicinity of College Station during the last 10 yr., are noted.

Cotton flea hopper control in 1936, K. P. Ewing and R. L. McGarr (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 850–854, figs. 4*).—A report is made of the results of four small-plat and four large-scale dusting experiments conducted in 1936, in which a comparison was made of sulfur, a mixture of 10 percent paris green and 90 percent sulfur, and a mixture of 20 percent calcium arsenate and 80 percent sulfur for the control of the cotton flea hopper. "Infestation records showed practically no difference between the control secured from the two mixtures, and both mixtures gave better control than the sulfur alone. Bloom counts in the small-plat experiments showed that the cotton in the plats dusted with each mixture fruited about alike. In the plats dusted with sulfur there was an average of 86 percent as many blooms as in the plats dusted with the mixtures, while in the untreated plats there were less than half as many as in any of the treated plats. Excessive rains during the normal fruiting season seriously affected the yield and reduced the gain that might otherwise have resulted from the control measures. The average gain in pounds of seed

cotton per acre from the eight experiments [was] as follows: Paris green and sulfur mixture 128.9 lb., calcium arsenate and sulfur mixture 111.9 lb., and sulfur 111.1 lb."

Cotton flea hopper, an ecological problem, F. L. Thomas and W. L. Owen, Jr. (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 848–850*).—Observations conducted by the Texas Experiment Station have shown that injury by the cotton flea hopper to cotton is due more to the scarcity of other plants or weeds, such as primrose, the horsemints, and croton, or goatweeds, which the pest prefers, than to its selection of cotton. If given a chance to find its preferred host, the necessity for its having to feed on cotton and the injury resulting will be reduced. Strip planting, a form of crop rotation and diversification, is recommended.

Physiology of psyllid yellows of potatoes, J. R. Eyer (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 891–898, figs. 6*).—The results of a further study of psyllid yellows of potatoes (E. S. R., 69, p. 828) conducted at the New Mexico Experiment Station are reported. It is pointed out that the infection cannot be transmitted mechanically through the customary inoculation mehods, nor is it carried over in the seed, being produced only by the feeding of the nymphal stages of the jumping plant louse or potato psyllid *Paratrioza cockerelli*. The adult psyllids are incapable of producing it. No incubation period is necessary as is the case in most insect-transmitted virus diseases, and the nymphs need not have fed previously on infected plants in order to produce typical symptoms. When the insects are removed, the plants exhibit entire or partial recovery provided they are not too near maturity.

Aphid taxonomy as related to economic entomology and plant pathology, M. A. Palmer (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 910–913*).—The importance of a knowledge of aphid identity is emphasized in this contribution from the Colorado Experiment Station.

Study of control measures against cotton aphid, C. C. Wu (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 898–900*).—This brief summary deals with the distribution, life history, cause of outbreaks, and control measures against the cotton aphid, based upon the author's study during 1936 in Hopeh Province, China.

Some aphids of the genus Capitophorus, G. F. Knowlton and C. F. Smith (*Canad. Ent., 69 (1937), No. 7, pp. 150–152*).—Under the name *C. rusticatus* an aphid collected on *Artemisia tridentata* in Wyoming, Idaho, and Montana is described as new to science in this contribution from the Utah Experiment Station. Distributional notes are given on other species of the genus.

On the synonymy and biology of the strawberry aphis Capitophorus fragariae Theo. (1912), W. E. H. Hodson (*Bul. Ent. Res., 28 (1937), No. 3, pp. 409–416, pls. 2*).—Reference is made to the proved capacity of the aphids of the genus *Capitophorus* to transmit virus disease among strawberries, and attention is drawn to the confusion existing as to the synonymy of the insect principally concerned. For the first time sexual and asexual forms of the species commonly present in England have been observed together. Evidence is considered which suggests that the aphid is *C. fragariae* and that American forms are in reality other, but closely related, species. The incidence of the aphid in the field is considered, and the biology as observed in field and laboratory is discussed. The economic significance of the aphid is referred to, and attention is drawn to the practical difficulties attending efforts to keep it in control, particularly in commercial strawberry-growing areas.

Discovery of an autumn host plant of Myzus persicae Sulzer, J. C. Burnham (*Canad. Ent., 69 (1937), No. 9, p. 208*).—In a search made between September 8 and 11, 1937, in the potato-growing section of Carleton County, N. B., the

alate form (fall migrants) of the green peach aphid, which leaves the potato plants in September, was discovered to be feeding and rearing young on the foliage of *Prunus pennsylvanica* and *P. virginiana*.

The toxic dose of mealy-bug wilt of pineapple, W. CARTER (*Phytopathology, 27 (1937), No. 10, pp. 971–981*).—In this further contribution on the pineapple mealybug from the Hawaiian Pineapple Producers' Experiment Station (E. S. R., 69, p. 829; 74, p. 668) the results of a series of experiments on the relationship between the numbers of mealybugs applied to pineapple plants and resulting wilt are reported. It was found that occasional plants wilt following infestation by single mealybugs, and that the percentage of pineapple plants wilting as a result of infestation by mealybug colonies of varying size increases with the number of mealybugs. This increase is not directly proportional to the number of mealybugs, there usually being a point on the dosage scale that brings a disproportionate rise in wilt percentage; increased dosages beyond this point result in only small increases in wilt percentage. Variability between different experimental series is extremely high.

Lice on hibernating and non-hibernating mammals, F. H. WILSON (*Jour. Mammal., 18 (1937), No. 3, pp. 361, 362*).—It is pointed out that both sucking and biting lice are found only on homoiothermic hosts. All experimental work indicates that, while they can stand low temperatures for a short time, in order to maintain themselves and reproduce they require a temperature close to that found on their normal active hosts.

Sex ratios and the status of the male in Pseudococcinae (Hem.: Coccidae), H. C. JAMES (*Bul. Ent. Res., 28 (1937), No. 3, pp. 429–461*).—The citrus mealybug, the grape mealybug, the citrophilus mealybug, *Pseudococcus longispinus* Targ., and *Trionymus peregrinus* Green are reported upon.

Notes on the life history and control of the euonymus scale (Chionaspis euonymi Comstock), H. G. WALKER (*Va. Acad. Sci. Proc., 1934, p. 36*).—This is an abstract of a contribution from the Virginia Truck Experiment Station on the euonymus scale, one of the limiting factors in the use of euonymus as an ornamental plant in Virginia.

Scurfy scale assumes new importance in State, O. H. HAMMER (*Farm Res. [New York State Sta.], 4 (1938), No. 2, p. 6, figs. 3*).—A brief account is given of the life history of the scurfy scale, which, for some undetermined reason, has become extremely destructive in a small area in northern Dutchess and southern Columbia Counties and seems to be spreading in all directions from this relatively small area.

A large number of insecticide tests conducted have shown treatments applied in early spring before the eggs hatch to be the most effective. Spray emulsions containing from 2 to 3 percent of dinitro-*o*-cyclohexylphenol oil, 4.5 percent of coal tar oils, or from 3.5 to 4 percent of a combination of coal tar and lubricating oils have all given very satisfactory control. Because these oils will cause injury to green plant tissue, they must be applied while the trees are strictly dormant.

Notes on the infection of the seventeen-year cicada (Magicicada septendecim (Linn.)) by the fungus Massospora cicadina Peck, I. J. CANTRALL (*Bul. Brooklyn Ent. Soc., 32 (1937), No. 3, pp. 120, 121*).—Reference is made to observations of the infection of the periodical cicada by *M. cicadina* in the region of Ann Arbor, Mich., during the outbreak of 1936. It is concluded that the females, which were more heavily infected than the males, probably became infected before oviposition.

Sorghum webworm studies in Texas, H. J. REINHARD (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 869–872*).—Observations by the Texas Experiment Station of food plants, life history and habits, and prevention and control of the sorghum

webworm are reported. This webworm is said to be one of the major pests of grain sorghums in Texas and during wet seasons to become a limiting factor in their profitable production. Serious losses have been experienced throughout the eastern half of the State, but it has not as yet become established in the subhumid region of northwest Texas where grain sorghums are grown extensively.

The use of insecticides for control of the sorghum webworm is not practical, and the chief combative measures depend on crop management. Clean-up practices after harvest and timely planting are most important.

Natural control of the grey banded leaf roller (Eulia mariana Fern.) in Nova Scotia orchards, F. C. Gilliatt (*Canad. Ent., 69 (1937), No. 7, pp. 145, 146*).—Observations of the parasites and the predators of the gray-banded leaf roller, a pest which appeared in the Annapolis Valley orchards of Nova Scotia about 12 yr. ago and has since become one of the major orchard pests, are reported upon. Of the 32 percent mortality of pupae observed during the winter of 1935–36 in orchards at Somerset, Kings County, and Round Hill, Annapolis County, parasites were responsible for approximately 3 percent and predators 21 percent. It is thought that the remainder, which were more or less mummified and usually full of molds, were attacked by fungi. A list is given of 14 species of Hymenoptera and 4 of Diptera reared from pupae collected in the field. The egg parasite *Trichogramma minutum* was common, though not numerous, in 1935. The pentatomid *Podisus maculiventris* Say, a common predator, was unusually abundant in 1935. Other predators observed were the hemipterous species *Deraeocoris fasciolus* Knt. and *Anthocoris musculus* Say.

Possibilities of reducing overwintering pink bollworm population in the soil as shown by stripping tests, A. J. Chapman and H. S. Cavitt (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 837, 838*).—In work with the pink bollworm conducted at Presidio, Tex., during 1935 and 1936, stripping cotton plants of all fruiting forms on October 1 reduced the soil population by approximately 75 percent, on October 15 by 51 percent, and on November 1 by 18 percent. The tests indicate that early maturity of the crop combined with early picking and clean-up of the fields would greatly reduce the overwintering population of the pink bollworm.

Parasites of pink bollworm in northern Mexico, C. S. Rude (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 838–842*).—Observations of parasites of the pink bollworm in the Laguna, an irrigated district in the State of Durango and Coahuila in northern Mexico, where large acreages of cotton are grown and where the pink bollworm was introduced in 1911, are reported.

The parasites particularly considered are *Anachaetopsis* sp., *Microbracon platynotae* (Cush.), *M. mellitor* (Say), *Perisierola cellularis punctaticeps* Kief., and *Catolaccus hunteri* Cwfd. Of these, *M. platynotae*, which attacks the pink bollworm larvae in squares, blooms, and bolls, appears to be the most abundant. Mention is also made of several other possible parasites and of four introduced species, namely, *Exeristes roborator* (F.), *M. brevicornis* (Wesm.), *M. kirkpatricki* Wilk., and *Chelonus blackburni* Cam., of which the last-named has shown the greatest indications of becoming of value in combating the pink bollworm.

Imported parasites of pink bollworm at Presidio, Tex., 1932–36, L. W. Noble and W. T. Hunt (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 842–844*).—Notes are presented on six species of foreign parasites of the pink bollworm which have been imported during the last 5 yr. and propagated at the Presidio laboratory of the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with the Texas Experiment Station, namely, *Exeristes roborator* F., *Microbracon brevicornis* Wesm., *M. kirkpatricki* Wilk., *M. mellitor* Say, *Chelonus blackburni* Cam., and *Elasmus platyedrae* Ferrière.

Outbreak of armyworms (Cirphis unipuncta Haw.) in Saguenay County, Quebec, H. F. Lewis (*Canad. Ent., 69 (1937), No. 10, pp. 231–233*).—An outbreak of the armyworm, observed by the author in the summer of 1937 along the north shore of the Gulf of St. Lawrence from Baie Johan Beetz to La Tabatière, a distance of about 190 miles, is reported upon.

Life-history notes on the spotted-sided cutworm Agrotis badinodis Grote, H. H. Walkden (*Jour. Kans. Ent. Soc., 10 (1937), No. 1, pp. 20–26, fig. 1*).—This contribution reports observations made in the Middle West during the past few years of *A. badinodis*. This is one of the more obscure or less well known species of cutworms, no outbreak ever having been recorded.

Notes on the life history of the bronzed cutworm in Kansas, H. H. Walkden (*Jour. Kans. Ent. Soc., 10 (1937), No. 2, pp. 52–59, fig. 1*).—The results of observations of the distribution and economic importance, seasonal history, life cycle, larval habitat, parasites, and diseases of the bronzed cutworm, made in Kansas during the past few years, are reported. Though a pest of minor importance on cereal and forage crops in the eastern Great Plains region, occasionally favorable conditions permit it to increase to a point where grasslands, particularly bluegrass areas, suffer moderate damage by larval feeding.

A new gooseberry pest, Stretchia plusiaeformis Hy., J. L. Hoerner (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 900–902, figs. 2*).—The native cutworm *S. plusiaeformis* is reported to have appeared at Manzanola, Colo., in 1931 and become a source of injury to the gooseberry through cutting holes in the sides of the fruit and eating out the seeds. The best control is obtained from the application of 3 lb. of lead arsenate in 100 gal. of water to the expanding leaves, which serve as food for the young larvae.

Flight range and longevity of flood-water mosquitoes in the lower Columbia River Valley, H. H. Stage, C. M. Gjullin, and W. W. Yates (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 940–945, figs. 5*).—A study of the flight range and longevity of *Aedes vexans* Meig. and the northwestern floodwater mosquito in the lower Columbia River Valley, made in the course of research on the biology and control of these mosquitoes, is reported.

The multiplication of the virus of yellow fever in Aëdes aegypti, L. Whitman (*Jour. Expt. Med., 66 (1937), No. 2, pp. 133–143*).—The author, working at the Yellow Fever Service Laboratory at Bahia, Brazil, has shown that the Asibi strain of yellow-fever virus is capable of multiplying in the yellow-fever mosquito. "Following the ingestion of infected blood, the content of virus falls for several days, reaching a minimum during the first week. It then increases rapidly until quantities of virus greater than those previously encountered can be demonstrated. The actual final amount of virus demonstrable, however, is subject to variations of which we know little."

Hessian fly eggs and freezing temperatures, W. T. Emery (*Jour. Kans. Ent. Soc., 10 (1937), No. 1, pp. 28, 29*).—Observations made of the effect of freezing temperatures on the vitality of eggs of the hessian fly in January 1934 are detailed in table form. From 28 to 86 percent of the eggs exposed to temperatures which varied from 11° to 17° F. are shown to have hatched.

Natural dispersion of Cochliomyia americana, W. L. Barrett, Jr. (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 873–876*).—In observations of the screwworm from March 5 to August 1, 1936, evidence was obtained that it migrated from Uvalde on the northern boundary line of the overwintering area in southern Texas to Buffalo, Okla., near the boundary of Kansas. "The average weekly rate of dispersion (after the advent of continuously warm weather) was about 35.4 miles toward the north and about 20.3 miles toward the northeast. The rate of spread toward the east was much slower. At times, however, the rate

of weekly dispersion to the north apparently exceeded the average of 15 miles. The rate at which the fly dispersed shows that under favorable conditions areas about 1,500 miles from the northern edge of the overwintering zone may become infested as a result of the seasonal spread of the insect. The fly appears to disperse readily from areas in which the population of the species is low. Adult flies are not ordinarily carried by moving vehicles."

Insecticides to control blowfly larvae in wounds, E. R. McGovran (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 876–879*).—In experiments conducted at Valdosta, Ga., in 1936 the author found that soluble pine oils Nos. 1 and 2 when combined with 95 percent nicotine and methyl thiocyanate, respectively, and benzol with a cotton plug in the wound were effective larvicides for the treatment of wounds on goats and sheep infested with larvae of the screwworm.

New North American muscoid Diptera, H. J. Reinhard (*Bul. Brooklyn Ent. Soc., 32 (1937), No. 2, pp. 62–74*).—Two species belonging to the family Stephanostomatidae (Sarcophagidae auct.) and six to the family Tachinidae are described as new in this contribution from the Texas Experiment Station.

Studies on brood A June beetles in Iowa, F. Andre (*Iowa State Col. Jour. Sci., 11 (1937), No. 3, pp. 267–280*).—A report is made of a survey conducted by the Iowa Experiment Station during the summer of 1935 in an effort to determine the distribution of the various species of brood A June beetles in Iowa.

"Sixty-nine counties were visited, and a total of 42,559 specimens comprising 26 species of beetles were collected. *Phyllophaga implicita* occurred more abundantly than any other form, while *P. hirticula* ranked second and *P. rugosa* third.

"Field experiments with four poison dusts were conducted, namely, paris green, acid lead arsenate, calcium arsenate, and sodium fluosilicate. Each was diluted with bentonite to form a bulk mixture of 60 percent bentonite and 40 percent poison dust. Under field conditions their toxicity value ranked in the descending order named. A large number of beetles fed for various periods of time and left the plants when the foliage was dusted with the first three poisons mentioned. When these were collected by hand picking just before they left a larger kill was obtained than was the case where the beetles fed on the poisoned foliage for a 4-hr. period. This was attributed to the fact that the beetles received a toxic dose of poison, became sick, and started to fly back to their hiding places in the soil. Results obtained with paris green, acid lead arsenate, and sodium fluosilicate under field conditions closely paralleled those obtained with the same compounds under laboratory conditions."

See also a previous note (E. S. R., 76, p. 222).

Tests for boll weevil control, using Latin square plat arrangement, Tallulah, La., 1936, R. C. Gaines (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 845–848, fig. 1*).—Records of boll weevil infestation at Tallulah in 1936 indicated that the best control was secured "with calcium arsenate, followed in order by calcium arsenate and sulfur 50:50 and calcium arsenate and lime 50:50. Records of plant height indicated uniform plant growth throughout the various plats. Plant counts indicated a very uniform number of plants throughout the plats. Bloom counts and boll counts indicated that there was a greater amount of fruiting in the plats treated with calcium arsenate, followed in order by plats treated with calcium arsenate and sulfur 50:50 and plats treated with calcium arsenate and lime 50:50, with the untreated plats producing the smallest amount of fruit. These records all seem to fit in very nicely with the yields. It appears that the increased yields caused by the three different treatments used when compared with yields in untreated plats are significant, that the increased yield for calcium arsenate is not significant, and that the increased yield for calcium

arsenate treatments over treatments with calcium arsenate and sulfur 50:50 is not significant."

Temperatures at which boll weevils freeze, E. Hixson and C. A. Sooter (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 833–836, fig. 1*).—Observations in Oklahoma over a period of 7 yr. have shown the cotton bollweevil to be much more resistant to cold than formerly supposed. The undercooling temperatures of 991 bollweevils showed a range from 26.6° to −9.4° F. Those undercooled in November and February were the most resistant, while those undercooled in December and March were the least resistant. Winters having low minimum temperatures were followed by small field populations of hibernated weevils whether the population the previous year was large or small.

Toxicity of high temperatures to bean weevil eggs, H. Menusan, Jr., and G. F. MacLeod (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 954–958, fig. 1*).—In reporting upon the results of studies conducted, the details of which are given in tables, it is pointed out that the relation of mortality of bean weevil eggs to time of exposure and to temperature used can be expressed by two asymmetrical curves. "The largest variation in percentage mortality of the eggs occurred in the middle portions of the curves and decreased toward each end of the curves. Due to the asymmetry of the two curves, the smallest errors in terms of time or temperature of exposure, i. e., dosage equivalents, [were] in the case of variable temperatures in the high mortality range and in the case of variable time of exposure in the low mortality region. The resistance of eggs to high temperatures increased with the age of the eggs. Eggs surviving high temperature exposures were delayed in hatching, and the amount of delay was directly proportional to the resultant mortality for any given treatment."

Wintering bees in Minnesota, M. C. Tanquary (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 945–948*).—The replies to a questionnaire issued by the Minnesota Experiment Station in the spring of 1936 to about 500 beekeepers in the State, relating to the most serious wintering problems met with by apiarists, are considered.

The control of carpenter ants in telephone poles, R. B. Friend and A. B. Carlson (*Connecticut [New Haven] Sta. Bul. 403 (1937), pp. 909–929, figs. 6*).—Report is made of an investigation of means for preventing the increasing loss in telephone poles caused by carpenter ants, particularly the black carpenter ant, conducted from 1933 to 1937, inclusive.

The experiments conducted have shown that a suitable chemical injected forcibly into the top of an ant cavity in a sufficient quantity will eliminate the ant colony from the pole. Coal tar creosote diluted with an equal volume of either refined creosote or gasoline was efficient and not expensive. The fact that dead ants were found in galleries where no stain of creosote was visible indicated that the fumigant properties of the mixture are of some importance.

"Although poison baits have been successfully used in controlling carpenter ants under certain conditions, there are obvious objections to using such poisons in this work. Aside from the difficulties of preparing and handling poisons, it does not appear advisable to use them where their ultimate disposition is unknown. The few trials made with a thallium sulfate bait indicated a certain effectiveness, but the creosote mixtures are more effective and easily handled. The sodium arsenite solutions used were ineffective.

"The failure of the highly volatile fumigants used in the earlier trials makes their practical value under the conditions very questionable.

"From a practical standpoint there is a limit to the size of ant cavities which can be treated successfully. If the cavity extends over 7 ft. above the ground level, the results of treatment are questionable. Moreover, the thickness of

sound shell in such cavities is very likely to be below minimum requirements. These long cavities are also very likely to have long narrow galleries extending high into the pole and not subject to treatment. Generally speaking, any pole containing an ant cavity which extends over 7 ft. above the ground line should not be treated but should be replaced.

"The amount of material to be injected depends mainly on the size of the cavity. It is the opinion of the authors, based on an examination of the poles treated, that not less than 1 pt. should be injected into a cavity 4 ft. or less in length, and not less than 2 pt. into cavities between 4 and 7 ft. in length. The success or failure of the treatment depends on the skill of the operator.

"Whether or not a treated pole will become reinfested with ants in the future has not been determined. No reinfestation has taken place in successfully treated poles within 2 yr. of the time of treatment. The presence of creosote in the walls of the cavity would tend to repel ants. If a new colony should become established, it would not become large enough to cause serious injury to the pole within 2 yr. of the time of establishment, which would be 3 yr. after treatment. Poles are inspected every 3 yr., and such an inspection would detect the ant colony in time to avoid much injury.

"The observations on infested poles lead the authors to believe that an inspection every 3 yr. is sufficient to detect ant colonies in chestnut poles before the injury due to the ants will cause a pole to fail."

Temperature preference of the firebrat (Thermobia domestica Packard) (Thysanura), J. A. Adams (*Iowa State Col. Jour. Sci., 11 (1937), No. 3, pp. 259–265, figs. 2*).—A description is given of a thermotropometer designed for determining the temperature preferences of the firebrat, together with the results obtained in its use.

A new species of Apanteles (Hym.: Brac.) bred from Myelois ceratoniae attacking carobs in Cyprus, D. S. Wilkinson (*Bul. Ent. Res., 28 (1937), No. 3, pp. 463–466, figs. 3*).—A parasite of the pyralid *M. ceratoniae*, a pest of the beans of the carob tree (*Ceratonia siliqua*) in Cyprus, is described as new under the name *A. myeloenta*.

Notes on the biology of Microplectron fuscipennis Zett. as a cocoon parasite of Diprion polytomum Hartig, W. A. Reeks (*Canad. Ent., 69 (1937), No. 8, pp. 185–187*).—A 3-yr. study has shown the eulophid parasite *M. fuscipennis*, introduced from Europe where it is widely distributed, its habits there having been reported upon by Morris and Cameron (E. S. R., 74, p. 377) and by Ullyett (E. S. R., 76, p. 80), to give promise of becoming an important factor in the control of the European spruce sawfly in Canada. It is definitely known to withstand the rigorous winters of Quebec.

The insect parasites of the spruce sawfly (Diprion polytomum Htg.) in Europe, K. R. S. Morris, E. Cameron, and W. F. Jepson (*Bul. Ent. Res., 28 (1937), No. 3, pp. 341–393, figs. 20*).—A report is made of the progress of a study by the Imperial Institute of Entomology of parasites of the European spruce sawfly, an outbreak of which pest over a large area in the center of the Gaspé Peninsula in eastern Quebec, Canada, was discovered in 1930, as reported by Balch and Simpson (E. S. R., 68, p. 74). Introduced without its natural enemies and reproducing in America parthenogenetically without native parasites, it has continued to increase in importance and now constitutes one of the most serious and dangerous forest pests introduced into North America. Severe damage was caused in 1936 over some 10,000 sq. miles, and its range extended southward through New England into Connecticut and westward into the Province of Ontario. In Europe, where the work was conducted and it normally reproduces bisexually, it occurs over the entire range of spruce (*Picea excelsa*) from Finland

to Yugoslavia, but has never caused serious damage to the forests, being on the whole a comparatively rare insect. Since the work was commenced, at which time 11 species and 1 variety of parasites had been recorded, 25 additional forms have been reared from the larvae or cocoons of this and related species (particularly *D. sertifer*), which will usually attack the European spruce sawfly, the majority having been collected in Czechoslovakia.

Brief descriptions and a key are given to the adults of 31 forms, together with information on their biology and descriptions and a key to the mature larvae of the primary parasites. Fifteen of the 31 forms are primary, 5 can be primary or secondary, 9 secondary only, and the status of 2 is unknown. Eleven forms have been introduced into Canada, of which several have become established.

Control of the garden centipede in California, A. E. MICHELBACHER (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 886–891, fig. 1*).—Studies of the garden centipede, conducted in the delta of the Sacramento River, have shown that it can be successfully controlled by flooding infested fields in summer for a period of from several days to a week. The observations indicate that cultural methods used in the growing of different crops have an influence on the population of this pest.

"Calcium cyanamide had apparently little effect upon the garden centipede, but the application of the material might prove very beneficial if applied to soils deficient in available nitrogen. Carbon disulfide was found to be very effective against the garden centipede, even when applied to cold wet soil of a levee, if 2 oz. of the material were added to holes 18 in. apart and the holes in alternate rows staggered to minimize the distance the gas would have to diffuse."

Method of obtaining an index to density of field populations of citrus red mite, L. S. JONES and D. T. PRENDERGAST (*Jour. Econ. Ent., 30 (1937), No. 6, pp. 934–940, figs. 2*).—In work conducted at the California Citrus Experiment Station an accurate and relatively rapid method of obtaining an index to populations of the citrus red mite on citrus trees was found practicable. "This method involves the random collection of 50 leaves from each half of a tree and, when present, the selection of three heavily infested fruits from three relatively constant positions. The samples are placed in a 5 percent formalin solution immediately after picking.

"The samples are brought into the laboratory where the eggs are removed from the leaves by a hot solution of potassium hydroxide, and the solutions containing the mites and eggs combined in a Dazey churn. During uniform agitation a 200 cc aliquot is removed and filtered. The mites and eggs thus secured, which represent one-eighth of the total mites and eggs present in the sample, are then counted with a low-power microscope."

An eriophyid mite injurious to tomato, A. M. MASSEE (*Bul. Ent. Res., 28 (1937), No. 3, p. 403*).—A mite enemy of the tomato in Queensland, Australia, and Auckland, New Zealand, is described as new under the name *Phyllocoptes lycopersici*. It causes silvering and curling of the lower leaves, the stem and leaf stalks turn brown and the lower leaves and flowers fall off, and the fruits become stunted and rough-skinned.

ANIMAL PRODUCTION

Principles of feeding farm animals, S. BULL and W. E. CARROLL (*New York: Macmillan Co., 1937, rev. ed., pp. XI+395, figs. 60*).—In this revised edition the authors have completely rewritten the original text (E. S. R., 36, p. 597). The book is designed as a text for elementary courses in general feeding and as a handbook for practical livestock feeders.

Effects of mineral deficiencies in animals, B. W. FAIRBANKS (*North Amer. Vet., 18 (1937), No. 8, pp. 29, 30–33*).—This article offers a brief résumé of the effects of deficiencies of common salt, calcium, and phosphorus in the animal diet.

Comparative studies on the effects of calcium upon the growth of young animals, K. IGUCHI, K. MIYAMURA, and T. KAMIYA (*In Neue Forschungen in Tierzucht und Abstammungslehre [Duerst Festschrift]. Bern: Verbandsdruckerei AG., 1936, pp. 113–123, figs. 3*).—Experiments dealing with the effects of various calcium supplements in the ration of young rats receiving a basal diet of powdered unhulled rice and of young calves receiving a basal diet of timothy hay and rice bran are reported by the Hokkaido Imperial University, Japan.

Calcium supplements, in general, increased the rate of growth, decreased the phosphorus content, and increased the calcium content of the blood, urine, and feces, and increased the bone ash content of rats. With calves the calcium supplements markedly increased the rate of growth, decreased the inorganic phosphorus content, and increased the pH value of the blood and urine, but exerted little influence on the bone ash content. The relative effectiveness of the various calcium supplements is indicated.

Manganese and cobalt in plant and animal economy, E. BROWNING (*Sci. Prog. [London], 32 (1937), No. 126, pp. 276–289*).—This is a review of available information relating to the occurrence of manganese and cobalt in plant and animal tissues, with particular reference to their normal metabolism and their possible functions in the vital processes.

Relativity of physiologic time and physiologic weight, S. BRODY (*Growth, 1 (1937), No. 1–6, pp. 60–67, figs. 5*).—Investigations on the comparative rates of growth and senescence in different species of animals gave evidence that a given chronologic time unit has a different physiologic time significance in different organisms and in the same organism at different ages. However, when the age curves of growth and senescence of 10 different species were plotted against the unit of physiologic time, as proposed by the author, the curves closely coincided, indicating the correspondence of physiologic ages for these different species. Likewise it is suggested that a unit of physiologic weight equivalent to the 0.73 power of live weight is more useful for comparative purposes than gravitational weight.

The shape of the longissimus dorsi muscle in domestic animals, J. HAMMOND (In *Neue Forschungen in Tierzucht und Abstammungslehre [Duerst Festschrift]. Bern: Verbandsdruckerei AG., 1936, pp. 92–97, figs. 2*).—Based on records taken on entries in the carcass competitions of the Smithfield Club shows, data are presented on the width, depth, and shape index of the longissimus dorsi muscle for different weight groups of three breeds of swine, six breeds of sheep, and five breeds of cattle. The relation of the shape index of this muscle to the type and stage of maturity of the different groups is discussed.

Gastric secretion in ruminants, D. L. ESPE and C. Y. CANNON (*Amer. Jour. Physiol., 119 (1937), No. 4, pp. 720–723, figs. 3*).—The Iowa Experiment Station conducted a series of experiments to determine the rate of gastric secretion in calves during normal prefeeding periods, during periods in which the animals were teased with food or sham-fed, and during brief post-feeding periods. Three calves with Pavlov pouches, two of which also had esophageal fistulas, were employed.

The response during periods of teasing or sham-feeding with milk as compared with that during prefeeding periods led to the conclusion that the psychic phase of gastric secretion in these animals was absent or of very minor importance.

[**Livestock investigations in Colorado**] (*Colorado Sta. Rpt. 1937, pp. 18, 46*).—Results are briefly noted on the effects of continuous, deferred, and deferred-rotational grazing on range forage; the effect of ferric citrate and phosphoric acid on the incidence of perosis in chicks; and the value of sprouted oats and beet-top and soybean silages as sources of vitamin G in poultry rations.

[**Livestock investigations in Georgia**] (*Georgia Sta. Rpt. 1937, pp. 22-32, 37-41, figs. 9*).—Results are briefly noted on the value of peanut hay v. cowpea hay and of cowpea hay v. hay and corn-sorgo silage in beef cattle fattening rations; the value of winter grazing for dairy calves; menhaden fish oil v. cod-liver oil for growing pigs; the use of peanut meal with corn and with sweetpotatoes for fattening swine; the effects of grazing winter wheat on the rate of gain in suckling lambs; sweetpotatoes v. corn, and Sericea lespedeza hay v. cowpea hay for fattening lambs; the effect of light in sheep breeding; and methods of controlling internal parasites in sheep.

Pasture improvement studies yielded information on the rate of gain of brood cows and their calves on unfertilized pastures and on pastures receiving lime and phosphorus, and the comparative gains of steers on improved and unimproved pastures.

Nutritional characteristics of some mountain meadow hay plants of Colorado, J. W. TOBISKA, E. DOUGLASS, C. E. VAIL, and M. MORRIS (*Colorado Sta. Tech. Bul. 21 (1937), pp. 23*).—In extension of early studies (E. S. R., 2, p. 319), the hay samples described in this bulletin include 10 of the most common individual species of hay plants and mixed hays from upland, midland, and lowland areas. All samples were obtained from the North Park area during the seasons of 1933 and 1934. Data are presented on the organic and mineral analyses and the vitamin A, B, and G potency of the various samples. The fodder analyses of the nonleguminous species of the mountain hay plants, rushes, and sedges were not essentially different from those of similar plants grown in other regions. Silica proved to be the predominating ash ingredient in most of the hay plants. However, they contained as high a percentage of phosphorus as irrigated alfalfa and much more manganese than the alfalfa hay. Both the North Park hay and Colorado alfalfa contained adequate amounts of minerals for animal subsistence. Bio-assay of the 1933 samples showed that these hays contained from 15 to 30 or more units of vitamin A, from 1.5 to 4 units of vitamin B, and from 4.1 to 6.6 units of vitamin G per gram, indicating that such forages are a reasonably satisfactory source of these essential factors.

The mineral content of timothy hay and oat straw as fed in eastern Canada, P. O. RIPLEY and S. N. HAMILTON (*Sci. Agr., 18 (1937), No. 1, pp. 1-9*).—Data are reported on the calcium and phosphorus content of oat straw and timothy hay samples collected from eight experimental or demonstration farms in eastern Canada. The average percentage of calcium (dry basis) in oat straw ranged from 0.26 to 0.36. The average percentage of phosphorus was distinctly low throughout the series of oat straw, ranging from 0.06 to 0.16, with an average of about 0.07. The timothy samples ranged from 0.29 to 0.56 percent calcium and from 0.09 to 0.15 percent phosphorus. The series averaged 0.12 percent phosphorus, which is much nearer normal than in the case of oat straw.

The influence of airtight closing lids upon the progress of conservation and the quality of silage [trans. title], K. DIETRICH (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 3, pp. 255-286, figs. 2; Eng. abs., pp. 284, 285*).—The author has studied the progress of fermentation, the bacterial content, and the pH of clover and marrow-stem cabbage silages prepared without preserva-

tives and with additions of sugar, mineral acids, and carbon dioxide and sealed in airtight glass containers. Parallel trials were also conducted with silages covered with a layer of soil.

The airtight seal markedly retarded the progress of fermentation, especially in the upper layers of the silage. Sugar exerted a favorable influence on the fermentation process in both fresh and wilted plant material. Introduction of carbon dioxide exerted only a slight beneficial effect, and in silages receiving mineral acid and sealed the formation of carbon dioxide was so completely checked that artificial introduction of carbon dioxide was without effect. The upper layers of silage under a seal of loam were superior to those under the airtight seal. Protein losses and digestibility were not appreciably affected by the different manners of fermentation.

The relative vitamin A content of three varieties of North Western Dent corn—Manitoba-grown Red, Yellow, and American Yellow, M. C. HEBNER (*Sci. Agr., 18 (1937), No. 1, pp. 32–37*).—An experiment at the University of Manitoba compared yellow dent corn imported from the United States with Manitoba Yellow corn and Manitoba Red corn as sources of vitamin A for young growing chicks. Each variety of corn was fed at 20-, 40-, and 60-percent levels in the experimental rations and constituted the sole source of vitamin A.

Each of the Manitoba varieties was fully equal to the American Yellow corn, 20 percent of either of these varieties providing sufficient vitamin A for optimum healthy growth of chicks to 8 weeks of age. The growth rate of chicks on the 20-percent American Yellow corn diet was slightly below that obtained at the 40- and 60-percent levels.

Vitamins A, C, and D in maize as affected by variety and stage of growth, W. B. ESSELEN, JR., C. R. FELLERS, and B. ISGUR (*Jour. Nutr., 14 (1937), No. 5, pp. 503–511*).—The Massachusetts Experiment Station has determined the vitamin A, C, and D contents of six varieties of corn, obtaining samples of immature corn plants (25 cm in height) and of the plant and grain at the time of maximum growth, and again 1 mo. later when the leaves and stalks were beginning to turn brown.

There was a definite increase in vitamin A content of the plant as it approached maturity (49 and 76 units per gram dry basis for young and mature samples, respectively), but a marked loss both in vitamin A and moisture occurred after the plants had attained maximum growth. Only the yellow pigmented kernels contained demonstrable amounts of vitamin A, and the content of these decreased after maturity and as they dried out. The vitamin C content decreased with maturity, the young and mature samples averaging 93.5 and 72 units, respectively, per gram of dry matter. The fresh plant material contained an antirachitic substance which was rapidly lost on storage. The fresh immature or ripe kernels contained only traces of vitamin D. The importance of reporting vitamin data for plant material on a dry basis is stressed.

The vitamin content of sweet lupines: Sweet lupine meal from strains Weiko and 80 [trans. title], A. SCHEUNERT (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 3, pp. 242–249, figs. 2; Eng. abs., p. 249*).—Bio-assay of these two strains of alkaloid-free yellow sweet lupine indicated that the Weiko strain contained approximately 30 international units of vitamin A per gram, while the other strain was much lower. Both strains contained about 5.6 units of vitamin B_1 and over 1 biological unit of the growth-promoting factor per gram.

The relation of the method of drying cacao beans to the vitamin D content of the shells [trans. title], A. SCHEUNERT (*Biedermanns Zentbl., Abt. B,*

Tierernähr., *9* (*1937*), *No. 3*, *pp. 250–254*; *Eng. abs.*, *p. 254*).—The shells of artificially dried cacao beans were found to contain less than 10 percent as much vitamin D as the shells of sun-cured beans.

Inspection of commercial feeding stuffs, 1937, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 297* (*1937*), *pp. 108*).—This is the usual report of the guaranteed and found analyses of 400 brands of feeding stuffs collected during the year ended June 1937 (E. S. R., 76, p. 519).

Utilization studies with artificially dried, ground, protein-rich green feeds by ruminants [trans. title], G. Frölich and F. Habing (*Biedermanns Zentbl.*, *Abt. B*, *Tierernähr.*, *9* (*1937*), *No. 3*, *pp. 204–213*; *Eng. abs.*, *p. 213*).—The digestibility of the nutrients in ground and chopped artificially dried green alfalfa and in a chopped artificially dried vetch mixture was determined in trials with wethers. Data are presented on the composition and coefficients of digestibility for each product.

Grinding the alfalfa increased the digestibility of the crude protein, fat, and crude fiber as compared with the chopped alfalfa, while the digestibility of the nutrients in the vetch mixture was somewhat higher than in the alfalfa. The alfalfa meal, chopped alfalfa, and chopped vetch contained 108.3, 103.5, and 101.7 g of digestible crude protein and 293.3, 269, and 385.2 g of starch value per kilogram, respectively.

Further studies on the influence of green feed, silage, and hay on the metabolism of ruminants [trans. title], F. Schnepf (*Biedermanns Zentbl.*, *Abt. B*, *Tierernähr.*, *9* (*1937*), *No. 3*, *pp. 191–203*, *figs. 2*; *Eng. abs.*, *p. 203*).—These studies deal with the nitrogen and calcium balance, the carbon dioxide tension of the blood plasma, and the pH of the blood and urine of wethers as affected by the feeding of a red clover and timothy mixture in the fresh green state, as hay, and as silage. The silages were prepared either with additions of hydrochloric or sulfuric acids or with 1 percent of sugar.

The carbon dioxide level in the blood plasma and the levels of calcium retention followed similar trends when animals were subjected to the different feeding regimes so that each was considered a valuable measure of the healthfulness of various feeding stuffs. The pH of the blood showed only slight variations and was of little value in this respect. The pH of the urine showed very violent reactions to the influence of diet, but individual variations were too great to justify its use as a standard of comparison. Hay possessed a somewhat stronger basic effect than the green plant material. Silage prepared with sugar had a similar effect to that of green feed, but the acid silages had a pronounced negative influence on the calcium metabolism and blood picture. Replacing one-fourth of the dry matter in the acid silage ration with hay partially balanced the negative effects of the mineral acids.

Vitamins, minerals in cattle feeding, A. C. Dahlberg (*Farm Res.* [*New York State Sta.*], *4* (*1938*), *No. 2*, *pp. 1*, *6*).—This article refers to previous findings on the value of vitamins A and D concentrate for calves (E. S. R., 77, p. 237) and describes an extensive long-time feeding trial now in progress to determine the combined value of additional vitamins and minerals in the ration of presumably well-fed dairy calves and cows.

Roughage rations for finishing steers, J. H. Jones (*Cattleman*, *24* (*1937*), *No. 3*, *pp. 21*, *22*, *fig. 1*).—The results of an experiment dealing with a feeding program for the efficient utilization of home-grown feeds in the steer fattening ration is reported by the Texas Experiment Station. Six lots of steers, averaging approximately 720 lb. per head, were on trial for 196 days. All lots received 1.5 lb. of cottonseed meal and 2 lb. of whole cottonseed per day and hegari fodder ad libitum throughout the trial. Ground alfalfa hay was fed at

the rates of 2, 3, 4, 4, 5, and 6 lb. per head daily in lots 1 to 6, respectively, and ground milo grain was fed in increasing amounts during the last 84 days, equivalent to about 2.5 lb. per head daily throughout the trial.

The largest average daily gains per steer (1.64 lb.) and the greatest net profit ($39.68 per head) were realized on the hand-fed group of steers receiving 4 lb. of alfalfa daily, followed closely by the hand-fed groups receiving 5 and 3 lb. of alfalfa and the self-fed group receiving 4 lb. of alfalfa. The lowest daily gain and also the lowest net profit was realized on the group receiving 6 lb. of alfalfa. The feeding of large quantities of roughage in the fattening ration proved entirely satisfactory.

Beet tops for fattening steers, II, G. E. Morton and H. B. Osland (*Colorado Sta. Press Bul. 92 (1937), pp. 11, fig. 1*). The second report of this study (E. S. R., 76, p. 375) presents the results of the 1937 test, with extracts from the previous report.

Dried beet tops, beet top silage, and stacked beet tops were each fed as supplements to a corn-cottonseed cake-wet beet pulp ration for fattening steers. The dried tops or silage proved much more desirable than the tops stacked with straw. Clean tops were of the greatest value in the form of silage, but dirty tops gave best results when dried since this allowed the cattle to separate the soil from the tops. The loss of nutrients was least in the dried tops, followed by silage, and was by far the greatest in the stacked material. Replacing all the wet beet pulp in the basal ration with beet top silage gave unsatisfactory results. It is recommended that to avoid digestive disturbances the tops in any form should not be fed in large quantities for more than 120 days or in limited quantities for more than 150 days. Each ton of beets produced about ⅔, ⅓, and ⅕ ton of green, wilted, and dried tops, respectively. One group of steers receiving "C" molasses in place of cottonseed cake made satisfactory gains. Despite the bitterness of this product, it was apparently palatable to the steers and can be used to good advantage as a partial substitute for cottonseed cake.

The importance of cod-liver oil in the calf ration [trans. title], L. Palohеimo (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 3, pp. 234–241, figs. 5; Eng. abs., pp. 240, 241*).—Continuing the studies on rearing calves with limited amounts of whole milk (E. S. R., 77, p. 840), calves were subjected to the same feeding regime except that the cod-liver oil supplement was omitted from the diet. These calves thrived nearly as well as those receiving from 5 to 10 g of cod-liver oil daily, even though the total allowance of whole milk was limited to from 10 to 15 kg. There was no indication that special preparatory feeding of the dams during advanced pregnancy was necessary to insure thriftiness of the calves reared in this manner.

The problem of yellow beef fat, H. R. Guilbert (*Calif. Cattleman, 2 (1937), No. 2, pp. 6, 7, 12*).—This article discusses the yellow fat problem with reference to the causes of yellow color in fat and reasons for buyer prejudice against yellow carcasses. Recommendations are offered for meeting this problem along the lines of consumer education to overcome such prejudice and a minimizing of fat color as a factor in determining grade of beef. From the producer standpoint certain practical feeding methods are suggested which will tend to reduce the yellow fat color in market cattle.

A study of the utilization of glycine as a protein substitute for growing sheep [trans. title], J. Schmidt, J. Kliesch, H. Forsthoff, and E. Reddelien (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 3, pp. 214–223; Eng. abs., p. 223*).—Sheep from 25 to 40 kg in weight were not affected by the presence of glycine in the ration but the feed intake and development of younger animals were unfavorably influenced by glycine feeding.

A study of the value of corn, cottonseed meal, alfalfa hay, prairie hay, and wheat pasture for fattening lambs, H. M. Briggs (*Southwest. Sheep and Goat Raiser, 7 (1937), No. 2, pp. 8, 21*).—In a lamb-feeding experiment reported by the Oklahoma Experiment Station a variation from the usual feeding trial procedure was introduced in that the amount of feed intake was regulated so that approximately equal average daily gains were made by all lots. When all rations contained adequate amounts of protein this method gave a direct measure of the energy value of the feeds studied for fattening purposes.

Three lots of lambs on a uniform allowance of alfalfa hay received corn and cottonseed meal at the rates of 1.16 and 0, 1.05 and 0.1, and 0.54 and 0.71 lb. per lamb daily, respectively. When fed at the rate of 0.1 lb. per lamb daily cottonseed meal was worth 141 percent more in productive value than the corn it replaced, but at the higher level of feeding it had a value of only 85 percent that of corn. Three lots receiving a constant allowance of corn and cottonseed meal but varying amounts of alfalfa and prairie hay indicated that with adequate protein in the ration the productive value of prairie hay was 79 percent that of alfalfa. A combination of alfalfa and prairie hay (0.3 : 1) was no more efficient than prairie hay alone.

Comparing the rate of gain of both light and heavy lambs on wheat pasture with and without grain indicated that grain feeding was not economical. The light lambs made more rapid gains than the heavy lambs, but did not finish quite so well. The percentage of shrinkage, dressing percentage, and market grades of the various lots of lambs are presented.

Western slope lamb feeding, G. E. Morton, H. B. Osland, and R. C. Tom (*Colorado Sta. Press Bul. 91 (1937), pp. 7*).—The results of feeding trials over a 114-day period with 4 groups of 65 lambs each are reported. The experimental rations were (1) corn and alfalfa hay, (2) corn, cottonseed cake, and alfalfa, (3) corn, discard beet molasses, and alfalfa, each of which were hand-fed, and (4) corn, beet molasses, and alfalfa, self-fed as a ground mixture.

The addition of cottonseed cake to the basal corn-alfalfa mixture promoted greater and more economical gains. Each ton of cake replaced 3,349.3 lb. of corn and 140.3 lb. of alfalfa in the ration. At prevailing prices the beet molasses proved a profitable substitute for part of the corn in the basal ration. Each ton of molasses replaced 1,691.7 lb. of corn, but required 2,140.1 lb. more alfalfa. The molasses-fed lambs were not as firmly fleshed as the check lot and required at least 10 days longer in the feed lot to attain a comparable degree of finish. Self-feeding the ground mixture produced greater gains, but required more feed per unit of gain and proved less economical than hand-feeding.

The influence of sulphur in a ration on the growth and properties of wool, II, J. C. Swart (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 3, pp. 307–336, figs. 4; Ger. abs., pp. 333, 334*).—Continuing this study (E. S. R., 77, p. 834), two groups of wethers fed on a high plane of nutrition alternately received rations high and low in sulfur. The results gave no indication that a higher sulfur content in the ration influenced the live weight of the sheep, the total weight of wool produced, or the sulfur content of the wool. Further, staple length, average fiber diameter, or extensibility of wool were not influenced by the level of sulfur feeding. There was a tendency for rations high in sulfur to increase the number of crimps per unit length of wool, but to decrease the carrying capacity per unit of cross-section area.

The influence of calcium and phosphorus in a ration on the growth and properties of wool, III, J. C. Swart (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 37 (1937), No. 1, pp. 77–91, figs. 2; Ger. abs., pp. 90, 91*).—In further studies, one group of mature wethers received a low calcium basal

ration (CaO/P_2O_5 ratio of 1:17.1), while the second group received the same basal ration supplemented with ground limestone and steamed bonemeal (CaO/P_2O_5 ratio of 1:0.9).

Analyses of the data from these two groups indicated that an excessive amount of calcium and phosphorus in the ration had a tendency to retard body weight increases, to decrease the monthly growth of staple length and total fleece weight, and to produce a finer wool of greater extensibility and with a higher percentage of fibers showing a three-phase extension curve. The supplemented ration had no influence on the varying capacity per unit area of cross section of wool fiber or on the crimps per unit length of wool produced.

Standardisation of quality numbers of wool, IV, J. C. Swart (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 37 (1937), No. 2, pp. 219–236, figs. 3; Ger. abs., pp. 235, 236*).—A comparison of certain described arbitrary quality standards used in wool grading with the actual diameters and crimp of wool samples gave evidence that the arbitrary and crimp quality numbers showed a fairly close agreement, but that diameter quality numbers did not show a high percentage of agreement with the arbitrary standard, diameter values exceeding the arbitrary numbers for fine wools but falling below it for coarse wools.

It is concluded that such arbitrary standards should be used only in a descriptive sense as an expression for a certain type of wool regardless of its fiber diameter. The wool character of breeding stock should be selected on the basis of crimp and fiber thickness and not on crimp as indicative of fiber thickness.

Swine feeding investigations, 1926 to 1930 and 1930 to 1935 (*Kansas Sta. Circs. 187 (1937), pp. 15, fig. 1; 188, pp. 26, fig. 1*).—Studies by C. E. Aubel and M. A. Alexander reported in Circular 187 for 1926–1930 deal with (1) the relative value of various protein supplements and protein supplementary mixtures for fattening swine, (2) corn v. Atlas sorgo for hogs, and (3) alfalfa pasture feeding v. dry-lot feeding for fattening spring pigs.

Cottonseed meal alone proved decidedly inferior to tankage as a supplement to corn and alfalfa pasture. However, the cottonseed meal-tankage mixture 1:1 proved a satisfactory substitute for tankage, and additions of bonemeal and ground limestone to cottonseed meal improved its feeding value. A mixture of equal parts of linseed meal and tankage was less effective than a 1:2 mixture, the latter proving equal to tankage alone as a supplement. Corn gluten meal either alone or in combination with bonemeal was an unsatisfactory substitute for tankage for fattening pigs in dry lot. Both cottonseed meal and corn gluten meal were more valuable as a protein supplement to corn when pigs had access to alfalfa pasture than when they received alfalfa hay. A ration of corn, tankage, and alfalfa hay, all self-fed, produced greater gains than one of corn and alfalfa self-fed plus tankage and shorts hand-fed as a slop. Sixty-one percent protein tankage promoted more rapid gains than 48 percent.

Shelled corn produced slightly more rapid daily gains and better finish than ground Atlas sorgo when each was self-fed to fattening pigs. The sorgo proved to be 93.5 percent as valuable as corn.

Pigs self-fed corn and tankage on alfalfa pasture made more rapid and more economical gains and consumed less than half as much tankage as pigs self-fed corn, tankage, and alfalfa hay in dry lot.

Tests from 1930 to 1935, by C. E. Aubel and W. E. Connell as reported in Circular 188, deal with (1) the relative value of various protein supplements and protein supplementary mixtures for fattening swine, (2) corn v. wheat for fattening hogs, (3) the desirability of restricting tankage in the ration of

fattening pigs when self-fed corn, (4) alfalfa pasture feeding v. dry-lot feeding for fattening spring pigs, (5) preparation of the grain feed for fattening pigs, and (6) soiling alfalfa for fattening pigs.

Linseed meal or cottonseed meal fed alone or the two mixed in equal proportions proved decidedly inferior to tankage as a protein supplement. However, mixtures of tankage, linseed meal, and cottonseed meal 2:1:1 or two parts of tankage with one part of either linseed meal or cottonseed meal were practically equal to tankage alone. Tankage and alfalfa hay, each fed free-choice, and a tankage-alfalfa meal mixture 3:1 were practically equal as supplements. Sweetclover hay proved inferior to alfalfa hay, but sweetclover meal was practically equal to alfalfa meal when fed in the above manner. Semisolid buttermilk proved less effective than tankage. Meat scraps were practically as efficient as digester tankage when fed to pigs on alfalfa pasture.

Pigs receiving ground wheat required less grain and less protein supplement per unit of gain than pigs receiving shelled corn, but whole wheat proved less efficient than the corn.

Feeding tankage throughout the fattening period to pigs receiving corn and alfalfa pasture or corn and alfalfa hay in dry lot gave markedly better results than when tankage was omitted or fed only during the early stages of the fattening period.

Previous observations on the value of alfalfa pasture for fattening pigs were confirmed by these studies.

There was little difference in the rate or efficiency of gain between lots receiving ground corn and shelled corn. Soaked corn increased the rate of gain but also increased the feed required per unit of gain as compared with shelled corn.

The hand-feeding of fresh-cut green alfalfa two or three times per week to pigs receiving corn and tankage was less efficient than alfalfa pasture but practically equal to alfalfa hay.

Chemical studies on chicken blood, S. R. SHIMER (*New Hampshire Sta. Tech. Bul. 69 (1937), pp. 16*).—Data are reported on the blood analysis of samples from 130 different birds, including 123 mature chickens and 7 immature pullets. Maximum, minimum, and average values are indicated for nonprotein nitrogen, uric acid, urea nitrogen, preformed creatinine, creatine and creatinine, calcium, phosphorus, glucose, chlorides, alkali reserve, and pH, and a composite value obtained for each of these constituents is compared with results obtained in other laboratories.

No difference could be noted in the more common blood constituents between birds suffering from paralysis, cannibalism, or the after effects of tremors, and normal birds. There was no significant difference in the nonprotein nitrogen, uric acid, and glucose between pullets fed a 16-percent protein and those fed a 26-percent protein diet or between mature birds of different breeds. The health of the bird, state of egg production, type of feed consumed, time of last feeding, and the cyclic action of the liver are listed as probable causes of the wide variation in the percentage of blood constituents which have been reported.

A bibliography of 60 titles is appended.

The utilization of food elements by growing chicks.—II, A comparison of protein concentrates from single and multiple sources, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul. 94 (1937), pp. 8*).—Continuing this line of investigation (E. S. R., 77, p. 838), a ration containing 12 percent of meat scrap as the sole protein concentrate and one containing 5 percent each of meat scrap, fish meal, and dried buttermilk were compared

in a growth and body analysis experiment with White Leghorn chicks. All chicks received identical amounts of the ration daily, accomplished by the hand-feeding of a pelleted ration.

The percentage rate of gain, the gain per gram of nitrogen consumed, and the mean net weight were greater in the lot fed the mixture of three protein concentrates. The average retention of nitrogen, calcium, and phosphorus was greater and the percentage of nitrogen, calcium, and phosphorus contained in the chicks was also slightly greater for the lot receiving the mixed protein supplement. Within the lots a significant difference was found between the sexes, the gain per gram of nitrogen fed and the percentage of nitrogen, calcium, and phosphorus retained being greater for the males than for the females on each ration.

Raising chickens with skim milk, with particular consideration to the different months of hatching [trans. title], E. Mangold and H. Damköhler (*Arch. Geflügelk., 11 (1937), No. 3–4, pp. 121–137, figs. 2; Eng. abs., pp. 136, 137*).—Groups of chicks hatched in March, April, and May were raised from 1 mo. of age to maturity on a diet in which skim milk was the only source of protein in comparison with control groups receiving a 20-percent protein diet with fish meal as the principal protein. Chicks receiving skim milk ad libitum consumed sufficient amounts to provide approximately a 20-percent protein diet except for the May-hatched chicks, which consumed somewhat less protein in the fourth and fifth months. Skim milk consumption averaged 0.57 l per bird in the first month and 4.62 l per bird in the fifth month. Optimum growth was obtained up to the fifth month on the skim milk ration, but with the onset of laying the birds did not consume sufficient protein for satisfactory egg production. The May-hatched chicks consumed more feed, utilized their feed more efficiently, and equaled the March-hatched chicks in weight at 5 mo. of age.

Kentucky bluegrass in all-mash rations, G. D. Buckner, W. M. Insko, Jr., J. H. Martin, and A. Harms (*Poultry Sci., 16 (1937), No. 6, pp. 426, 427*).—In tests at the Kentucky Experiment Station, in which 17 percent of air-dried bluegrass replaced wheat feed in a satisfactory basal ration and in which 27 percent of dried bluegrass replaced both wheat feed and dried skim milk, it was found that bluegrass in the diet materially reduced the total mash consumption by chicks, increased mortality, and materially reduced the rate of growth over a 10-week feeding period. Because of its bulkiness, due to its high fiber content, air-dried bluegrass is not considered a satisfactory ingredient in an all-mash ration for growing chicks. The ad libitum feeding of fresh bluegrass is recommended.

The vitamin A content of pilchard oil, H. I. Milne, L. Rudolph, and W. D. McFarlane (*Poultry Sci., 16 (1937), No. 6, pp. 383–387*).—Studies at the University of Alberta gave evidence that the vitamin A potency of good pilchard oil, as determined both by spectrophotometric methods and bio-assay with chicks, was much less than that of good cod-liver oil. In the chick tests, the growth rate followed fairly closely the vitamin A assay by means of spectrophotometry. The untreated pilchard oil showed a higher vitamin A potency than the unsaponifiable fraction, while growth response indicated that the latter value was a more accurate estimate of its biological value. Practically no difference was noted in the assay of the untreated cod-liver oil and its unsaponifiable fraction. There was no indication that pilchard oil contained a growth-promoting factor which was not vitamin A.

Observations on some symptoms of vitamin-A deficiency in chicks, B. W. Heywang and R. B. Morgan (*Poultry Sci., 16 (1937), No. 6, pp. 388–392, figs. 2*).—

Observations on certain deficiency symptoms in chicks receiving a vitamin A-deficient diet were made at the U. S. D. A. Poultry Experiment Station, Glendale, Ariz. Ataxia occurred in 226 chicks, with the age at first appearance ranging from 11 to 43 days and the duration of life after its appearance ranging from 1 to 25 days. Of all chicks examined for evidence of death from vitamin A deficiency, 52 percent were found to contain a deposit in the bursa of Fabricius. In most cases this deposit was white and varied in quantity from a few flakes to a plug which distended the bursa to more than normal size. All chicks having such a deposit had previously shown ataxia. A retention cyst filled with a clear fluid and apparently originating from the ureters was found in approximately 30 percent of the chicks which died while receiving the deficient diet. Many chicks showing such cysts also had a deposit in the bursa of Fabricius.

The influence of fat-soluble vitamins on egg production and egg shell composition, A. D. Holmes, F. Tripp, and P. A. Campbell (*Poultry Sci., 16 (1937), No. 6, pp. 404–415, figs. 4*).—In a test extending over 52 weeks, three groups of well-matured Rhode Island Red pullets were fed well-balanced all-mash rations. One, 1.25, and 2 percent of sardine body oil was added to the rations of groups 1, 2, and 3, respectively.

No significant differences were observed in the total mash consumption, gain in body weight, or extent of mortality in the three groups. The average egg production was 180.4, 187.8, and 197.2 for groups 1, 2, and 3, respectively, while the eggshell weight was least for group 1 and greatest for group 2 for practically the entire experimental period. The vitamin A reserve in the livers and the vitamin A and D content of the eggs from group 1 was materially lower at the end of the year's test than corresponding values for group 3.

The relative flavin (vitamin G) content of dried skimmilk, dried whey, and dried buttermilk, V. Heiman and J. S. Carver (*Poultry Sci., 16 (1937), No. 6, pp. 434–437, fig. 1*).—In a study at the Washington Experiment Station, the growth response of chicks on a flavine-lacking diet was compared with that on similar diets containing dried whey, dried skim milk, or sweet cream buttermilk, employing triplicate lots of 15 chicks for each ration.

By establishing the line of best fit between the mean weights of groups receiving 0, 3, and 10 percent of dried whey and then projecting on this line the weight increases over the negative controls induced by the other dairy products in the rations, it was ascertained that the neutralized dried whey contained between 10 and 20 percent more vitamin G than the dried skim milk. The dried buttermilk contained from 90 to 100 percent more than the dried skim milk and from 60 to 70 percent more than the dried whey.

Supplementary fats in the fattening ration, W. A. Maw, I. E. Puddington, and A. J. G. Maw (*Sci. Agr., 18 (1937), No. 2, pp. 102–107*).—Tests were conducted at Macdonald College, Quebec, in which live weight gains and degree of fattening of Rhode Island Red cockerels fed a basal fattening ration of wheat, oats, and barley were compared with those of similar groups receiving the same basal ration supplemented with corn and with varying amounts of corn oil.

Total gains on the corn-supplemented ration were slightly lower during the 21-day fattening period than on the basal ration, while all groups receiving corn oil exceeded the check lot in total gain. Greater gains were made with 14- and 21-day fattening periods as compared with a 7-day feeding period, and the gains during the shorter period had a very high coefficient of variability. The addition of corn to the basal diet increased the percentage of fat in the body tissue, but this effect was not observed in the rations containing corn oil.

Table poultry production, A. J. Macdonald and J. W. T. Kay (*Harper Adams Agr. Col. Bul. 14 (1937), pp. 21*).—In a comparison of four rations for growing chicks, in each of which corn meal and weatings (wheat feed) comprised 70 percent of the ration, equal proportions of corn and weatings produced heavier birds at 8 weeks of age than proportions of 7:3, 3:2, and 2:3. However, at 14 weeks of age there was little difference in the average weight of birds or in total feed consumed per pound of gain on the four rations. During a subsequent fattening period the average rate of gain for cockerels increased with each additional increment of weatings in the ration, i. e., most rapid gains were obtained at a corn: weatings ratio of 2:3 and least rapid gains at the rate of 7:3. In another fattening trial a ration of 5 parts of skim milk powder and 95 parts of ground oats gave as good fattening and proved more economical than a ration of ground oats mixed with skim milk or equal parts of skim milk and water.

A study of curved breastbone in the White Leghorn and Brown Leghorn breeds [trans. title], H. Biegert (*Arch. Geflügelk., 11 (1937), No. 7–8, pp. 209–248, figs. 19; Eng. abs., pp. 246, 247*).—The occurrence of curved breastbone was observed in three poultry flocks, including three strains of White Leghorns and one of Brown Leghorns and totaling 1,154 individuals.

The percentage of abnormal birds was essentially the same in all flocks, and the earlier hatches were more susceptible. Although the final percentage of abnormal chicks was similar for the two breeds, the deformity occurred at a more advanced age and with more severity in the Brown Leghorns. No difference between sexes was evident, and the extent of curvature was increased by roosting. This condition was evidently not associated with rickets, since varying the calcium and phosphorus contents and ratios in the ration and adding vitamin D in different quantities and from various sources failed to prevent or cure it, and high protein levels in the diet did not aggravate it. Individuals apparently varied in their ability to assimilate minerals, since the deformity occurred only in birds with poorly calcified beastbones. Inbred and outbred strains were equally susceptible. The abnormality did not exert a significant influence on the production and hatchability of eggs or on the quality of the progeny.

The comparative efficiency of vitamin D from cod liver oil and irradiated cholesterol for laying birds, R. M. Bethke, P. R. Record, O. H. M. Wilder, and D. C. Kennard (*Poultry Sci., 16 (1937), No. 6, pp. 438–441*).—The seven groups of White Leghorn pullets employed in a trial at the Ohio Experiment Station included a negative control lot and groups receiving 25, 50, and 100 U. S. P. units of vitamin D per 100 g of ration from irradiated cholesterol and from cod-liver oil.

Based on the body weight, mortality, egg production, percentage of dried eggshell, hatchability of eggs, vitamin D storage in chicks, and the vitamin D potency of egg yolks, it is concluded that irradiated cholesterol and cod-liver oil are equally effective as sources of vitamin D for laying birds. The results indicate that 50 or more U. S. P. units per 100 g of ration are required for optimum hatchability.

Interrelationships of egg production factors as determined for White Leghorn pullets, I. M. Lerner and L. W. Taylor (*Jour. Agr. Res. [U. S.], 55 (1937), No. 9, pp. 703–712*).—The California Experiment Station has analyzed the production records of two generations of selected White Leghorn pullets that had completed their full first biological laying year without a pause in egg production, i. e., had no periods of 7 consecutive days of nonproduction during that time. Two measures of annual egg production were used: (1) That

during the 365 days following the first egg, and (2) that from the time of first egg at sexual maturity to the last egg laid at the onset of fall molt. The record year was divided into three 4-mo. periods, designated winter (November–February), spring (March–June), and summer (July–October). Coefficients of simple correlation between the various observed factors and coefficients of multiple correlation between various combinations of independent variables and yearly production are indicated.

The percentage of the variance in annual egg production which could be accounted for by the variations in age at first egg, age at last egg, and winter, spring, or summer rates of production ranged from 55.3 to 91.4, with evidence that the variance of these factors is genetic in nature to a considerable degree. Among the factors considered, age at last egg was the most important single factor affecting egg production. The rate of production during either the winter or spring periods was more valuable than the summer-fall rate in predicting annual production.

The connection between the rate of maturity and the egg production of White Leghorn pullets, J. B. van der Meulen (*Landbouwk. Tijdschr.* [*Wageningen*], *49* (*1937*), *No. 602–603, pp. 656–664, fig. 1; Eng. abs., pp. 663, 664*).—Information is presented on the relation between the age at sexual maturity and the egg production of 938 White Leghorn pullets representing various strains and a wide range of feeding conditions. A curvilinear correlation was found to exist between rate of maturity and either winter egg production or total egg production. Variations in environmental conditions during the growth period were found to influence this relationship as well as the rate of maturity. Eliminating the records of those birds which came into production last materially increased the average production. No relation was apparent between rate of maturity and mortality or average weight of eggs produced after December.

The transmission of xanthophylls in feeds to the yolk of the hen's egg, V. Heiman and L. A. Wilhelm (*Poultry Sci., 16* (*1937*), *No. 6, pp. 400–403, figs. 3*).—In trials at the Washington Experiment Station varying quantities of dehydrated alfalfa leaf meal, Argentine yellow corn, domestic yellow corn, and mixtures of the alfalfa meal and corn were added to the basal diet of experimental groups of laying pullets. It was found that the first increment of xanthophylls added to the ration from any of the three sources caused a greater change in yolk color than additional corresponding increments. Alfalfa leaf meal produced a greater yolk pigmentation than corresponding quantities of corn, and the Argentine yellow flint corn gave a higher pigmentation than a like quantity of domestic yellow dent corn. When xanthophyll-rich feeds were added to the diet the increase in yolk color was very rapid, while the loss of xanthophylls from yolks was more gradual when such feeds were removed from the diet.

The effect on yolk color of various ingredients in poultry feeds, L. A. Wilhelm and V. Heiman (*Poultry Sci., 16* (*1937*), *No. 6, pp. 416–418, fig. 1*).—In further studies it was found that barley produced more yolk color than wheat, oats, or rye; green pea meal was only slightly less effective than a corresponding amount of alfalfa leaf meal in intensifying yolk color; none of the protein concentrates tested contained significant quantities of yolk coloring material; succulent alfalfa, fresh lawn clippings, and green curly kale produced essentially the same degree of yolk color, and fresh carrots had only a slight effect in this respect; and 2 hours' access to alfalfa range was nearly as effective in intensifying yolk color as 6 or 11 hr. on such range.

The Haugh unit for measuring egg quality, R. R. Haugh (*U. S. Egg and Poultry Mag., 43* (*1937*), *No. 9, pp. 552–555, 572, 573, figs. 5*).—The Haugh unit,

as described in this article, is based on the observation that the change in quality or condition of an egg varies as a negative logarithmic function of the albumin height. It is expressed by the formula

$$H.\ U. = 100\ LOG \left[H - \frac{\sqrt{G}(30W^{0.37} - 100)}{100} + 1.9 \right].$$

in which H equals the albumin height in millimeters, G is a constant 32.2, and W is the weight of the egg in grams. The correction for weight in this formula becomes zero when the weight of the egg is 2 oz., in which case the quality score varies as the logarithm of the albumin height. The numerical value of this index equals the quality value.

The relation of this unit of egg quality measurement to other scoring methods and the practical value of the formulas and charts presented are discussed.

The chemistry of eggs, P. E. Howe and H. W. Titus (*U. S. Egg and Poultry Mag., 43 (1937), No. 9, pp. 534–537, 575–577*).—This article from the U. S. D. A. Bureau of Animal Industry offers a critical review of recent developments in this field and points out promising fields for future research.

Egg turning, pipping position, and malpositions, T. C. Byerly and M. W. Olsen (*Poultry Sci., 16 (1937), No. 6, pp. 371–373, figs. 2*).—A study by the U. S. D. A. Bureau of Animal Industry of the effects of turning horizontally placed eggs about their long axes for the last time on the eighteenth, nineteenth, and twentieth days of incubation gave evidence that 90 percent of those turned on the eighteenth day were pipped on the upper shell surface, while those turned on the nineteenth day were pipped on all surfaces, and about 60 percent of those turned on the twentieth day were pipped on the lower shell surface. A comparison of the pipping position of one lot of eggs turned on the nineteenth day and normally incubated with the beak position of embryos in a similar lot of eggs turned on the nineteenth day and immediately cooled to prevent further embryonic development gave evidence that about one-half of the embryos in eggs turned on the nineteenth day oriented themselves with respect to gravity through their own efforts.

The size and shape of turkey eggs, E. M. Funk (*Poultry Sci., 16 (1937), No. 6, pp. 398, 399*).—Data presented by the Missouri Experiment Station on the size of turkey eggs laid by Bronze pullets during February, March, April, and May indicated a mean weight of 84.5 g, a mean diameter of 48.6 mm, and a mean length of 66.6 mm. The coefficient of correlation between weight and width was 0.895 and between width and length was 0.753. Variability of diameters and lengths was less than that for weight.

Squab production, C. S. Platt and R. S. Dare (*New Jersey Stas. Bul. 634 (1937), pp. 18, figs. 6*).—A report of the New Jersey State pigeon breeding test for the 5-yr. period ended September 21, 1936, is presented.

The average annual production per pair of birds entered was 11.4 squabs, totaling 214.9 oz. live weight. Average gross returns were $3.89 per pair, and the average net return over feed cost was $1.46 per pair. The spread between the highest producing pairs or the highest producing pens (five pairs) of each breed and the average of all entries indicates the possibility of improving production through selection and breeding. Brief reports of research trials indicate the beneficial effects of artificial lighting, the deleterious effects of an all-mash ration, and the adequacy of simple grain mixtures.

Practical suggestions for feeding, housing, hatching and rearing, marketing, and selection of breeding stock are offered.

Hatching pheasant chicks on Christmas day, T. H. Bissonnette and A. G. Csech (*Amer. Nat., 71 (1937), No. 736, pp. 525–528*).—Continuing previous light-

ing studies with pheasants,[3] birds were brought into laying at 185 days of age and eggs hatched on Christmas day, 138 days earlier than normal.

DAIRY FARMING—DAIRYING

Report of the Chief of the Bureau of Dairy Industry, 1937, O. E. Reed (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1937, pp. 36*).—Reports of investigations with dairy cattle at the Beltsville, Md., and field experiment stations include breeding, feeding, and management studies, with particular reference to increasing the milk- and butterfat-producing capacity of dairy herds through continuous use of good proved sires, chopping hay before storing, baling hay following field curing, snow-fence silos and other methods of preserving roughage and their maximum use in the dairy feeding program, making silage from legumes and grasses, corn silage and grain supplements as the entire ration, treatment for mastitis, artificial insemination, the relation of conformation and anatomy to producing capacity, bonemeal v. disodium phosphate, and input as related to output. Nutrition experiments noted include the relation between diet and fecundity, the vitamin A requirements of dairy cows, the carotene content of roughages, and the vitamin A potency of butter.

From studies with dairy products, results are presented on tests for mastitis, the curd tension of milk and its relation to digestibility, the composition of the fatty acids of milk, oxidized flavor development, the control of bacterial spores in milk, and certain factors relating to the manufacture of butter, cheese, and ice cream. In the field of new methods and utilization of byproducts, progress is reported in the use of whey for food purposes and in the production of lactic acid and lactose, improved methods in the manufacture of Cheddar- and Roquefort-type cheeses, and the use of valve-vented cans for packaging cheese. Data on milk-bottle losses, the cream line on raw milk, the stability of chlorine solutions, and the home production of sour cream are also reported.

[Progress of dairy research in Scotland] (*Hannah Dairy Res. Inst., Ann. Rpt., 8 (1937), pp. 24, pls. 2*).—This report of research in progress presents information on the protein requirements of dairy cows, the production of artificially dried grass, biochemical phases of milk secretion, the relative value of raw and pasteurized milk for calves, the pasteurization and bacteriological control of milk, bitterness and discoloration in canned cream, defects in canned milk products due to micro-organisms, the keeping quality of milk powders.

Relation of stable environment to milk production, M. A. R. Kelley and I. W. Rupel (*U. S. Dept. Agr., Tech. Bul. 591 (1937), pp. 60, figs. 21*).—The investigations reported in this bulletin were conducted at Genesee Depot, Wis., during the winters of 1930–31 and 1931–32 in cooperation with the Wisconsin Experiment Station. A large barn divided into four sections, each housing 22 cows, was used during both winters of the study, and during the last winter an open stable housing 8 cows was added to the test. Three of the test stables were held at constant different temperature levels, while the fourth section and also the open stable were allowed to fluctuate with the weather about as under usual herd management. Uniform lots of cows were stabled under the different temperature conditions, with all other environmental factors being held as uniform as possible. The extensive data presented indicate how different temperature levels, sudden changes in temperature, and drafts affect milk and butterfat production, water consumption, live weight, pulse, respiration, body temperature, and health of the cows.

The optimum barn temperature under the conditions of this trial appeared to be about 50° F. At 60°–65°, milk production was above the average, but

[3] Science, 83 (1936), No. 2156, p. 392.

butterfat was below the average. At these higher temperatures the rate of respiration was materially higher, and the cows appeared less comfortable, also cowpox was more prevalent than at lower temperatures, indicating that under good conditions artificial heating of stables is undesirable. Sudden changes of 10° within the range of 45°–65° principally affected the first three milkings. Risk of sickness, particularly pneumonia, increased with the degree of exposure to drafts. The rate of decline in milk production was greater in stables allowed to vary in temperature than in those held approximately constant. Cows in open barns dropped sharply in production during cold periods, but with the return of mild weather they recovered more quickly than cows in stanchions. Loss of milk yield during temporary cold was partially compensated by increase in the percentage of butterfat.

Fertilization of pastures for milk production, A. D. Pratt and C. W. Holdaway (*Virginia Sta. Bul. 309 (1937), pp. 15, figs. 5*).—The results of 7 years' investigation on the value of various fertilizer treatments for increasing the yield of bluegrass pastures are reported. All areas were grazed with milking cows which received no supplementary feed.

The increase in milk production due to various fertilizer treatments ranged from 31 percent for an annual application of lime and phosphate to 75 percent for heavy applications of complete fertilizer. The increase in digestible nutrients resulting from pasture fertilization cost more per unit than those from unfertilized areas. However, the increase in butterfat production was sufficiently great to still allow a margin of profit. Weeds and bare ground were replaced by pasture plants as a result of fertilization, and grazing was available earlier in the spring and later in the fall, thus shortening the barn feeding period. The effectiveness of any fertilizer treatment was largely dependent on the amount and distribution of rainfall. Five years of constant heavy grazing did not completely exhaust the available fertility provided by two heavy applications of complete fertilizer. The condition of surplus pasturage in late May and early June and scarcity of pasturage during the dormant period of bluegrass in July and August was made more acute by applications of fertilizer, emphasizing the need for supplementary pastures to provide grazing for such periods of shortage.

The use of extracted olive pulp in the feeding of milk cows [trans. title], R. Raimondi (*Riv. Zootec., 14 (1937), Nos. 2, pp. 77–84; 3, pp. 114–116, 119–125, fig. 1*).—In a reversal feeding trial with two groups of six milking cows each, a normal ration of mixed concentrates was compared with one in which 30 percent of olive pulp replaced an equivalent amount of corn, the rations being so adjusted as to contain similar amounts of digestible protein and crude fiber.

The ration containing the olive pulp proved to be palatable, being readily consumed by all individuals. Under the conditions of this test, milk and butterfat production was maintained equally well on the two rations, while the live weight gains were slightly less on the olive pulp ration. The olive pulp was very low in digestible protein, relatively high in cellulose, and was adjudged to have about one-third the nutritive value of corn.

Numerical analysis of the Ohio investigations into the mineral metabolism of milch cows: Factors influencing the intestinal absorption of calcium, A. Westerlund (*Lantbr. Högsk. Ann. [Uppsala], 4 (1937), pp. 55–88, figs. 7; Swed. abs., pp. 83–87*).—This paper presents a numerical analysis of experimental data published by the Ohio Experiment Station (E. S. R., 35, p. 481; 37, p. 169; 40, p. 373; 48, p. 375; 51, p. 873) on the mineral metabolism of milk cows.

With particular reference to factors affecting the amount of calcium excreted in the feces, it is shown that an increase in calcium consumption was accompanied by an equally large increase in fecal loss of calcium within the range

reported, indicating that the absorption of calcium is not improved by increased consumption. An increase in phosphorus consumption was accompanied by a reduction in fecal calcium, the calcium absorption consequently being improved. There was a tendency for a high digestible nitrogen intake to affect negatively calcium absorption. Heavy milking cows absorbed more calcium than light milkers, indicating that an increased demand on the part of the mammary gland improves intestinal calcium absorption.

With reference to urinary excretion, the greater the amount of urinary phosphorus the smaller was the amount of calcium absorbed. No optimum calcium : phosphorus ratio could be established from these data.

Physiology of dairy cattle, I, II (*Jour. Dairy Res. [London], 8 (1937), No. 1, pp. 105–131*).—Part 1, Reproduction and Lactation, by J. A. B. Smith, and part 2, Nutrition, by S. Morris, give comprehensive reviews of recent developments within these specific fields of dairy science. References to the literature during 1934–36 include 97 citations in the first review and 129 in the second.

The utilization of lactic acid by the lactating mammary gland, W. R. Graham, Jr. (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 1–9*).—Lactating goats surgically prepared as described were used as experimental subjects in this study by the Missouri Experiment Station. Arterial and mammary venous blood samples were taken simultaneously for comparative analyses.

Attempted balance experiments over short periods of time indicated that considerably more lactose was secreted by the mammary gland than could be accounted for by the removal of glucose from the blood. The analyses of arterial and mammary venous blood samples showed that an average of 29.5 percent of the glucose and 28.8 percent of the lactic acid was removed from the blood during its passage through the udder. In further balance experiments it was ascertained that about 85 percent of the lactose formed during experimental periods could be theoretically accounted for by the glucose and lactic acid removed from the blood. The possibility of amino nitrogen in the blood serving as a source of carbohydrates in milk secretion is discussed.

The utilization of fractions of the nitrogen partition of the blood by the active mammary gland, W. R. Graham, Jr., V. E. Peterson, O. B. Houchin, and C. W. Turner (*Jour. Biol. Chem., 122 (1938), No. 2, pp. 275–283*).—Employing the method of obtaining blood samples as described above, samples collected from lactating goats at varying intervals after milking were analyzed to determine arterial-mammary venous differences for nitrogen partition of the blood. Nitrogen fractions determined included total, nonprotein, amino, and urea nitrogen in whole blood, and total, fibrin plus globulin, nonprotein plus albumin, nonprotein, amide, and fibrin nitrogen in the blood plasma.

These data indicate that the mammary gland was utilizing globulin, amino acids, and undetermined fractions of the nonprotein nitrogen partition of the blood, with evidence that milk nitrogen is derived chiefly from the globulin fraction. Large amounts of nitrogen were returned to the albumin fraction of the venous plasma. The mammary glands were in negative nitrogen balance for some time after milking with a gradual change to positive balance, indicating that nitrogen may be stored in the gland for utilization in the future production of milk.

The production of urea in the mammary gland, W. R. Graham, Jr., O. B. Houchin, and C. W. Turner (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 29–33*).—In studies at the Missouri Experiment Station with goats in early stages of lactation as experimental animals, the levels of urea nitrogen were determined in simultaneous samples of arterial and mammary venous bloods. These samples were obtained from animals nursing young and from milking animals at 1–2, 4, 8, and 14 hr. after milking.

All samples, except the group obtained at 1–2 hr. after milking, consistently showed a higher level of urea in the mammary venous blood, the average increase over that in arterial blood amounting to 4.5 percent. These results were interpreted as indicating that the mammary gland can produce urea from some nitrogenous source which undoubtedly comes indirectly from feed protein. The results are discussed with reference to the stimulating effect of high protein diets on lactation.

The vitamin C content of cow's milk, S. K. Kon and M. B. Watson (*Biochem. Jour., 31 (1937), No. 2, pp. 223–226, figs. 2*).—Studies at the National Institute for Research in Dairying gave evidence that milk from healthy cow udders contained vitamin C in only the reduced form, that the season of the year and the nutrition of the cows had no effect on the vitamin C content of mixed herd milk, and that the vitamin C content of colostrum was only slightly higher than that of normal milk. Limited observations indicated that milk from mastitis-infected quarters was lower in vitamin C than milk from normal udders.

Activatability of milk as affected by feeding ergosterol to cows, R. F. Light, L. T. Wilson, and C. N. Frey (*Jour. Nutr., 14 (1937), No. 5, pp. 453–457*).—The direct addition of 0.42 mg of ergosterol per quart resulted in an attaining by the treated milk of more than twice the antirachitic potency of normal milk when the two lots were subjected to comparable irradiation with ultraviolet light. When unirradiated ergosterol was fed to milking cows at the rate of 120 mg per cow daily, either in the form of crystalline ergosterol dissolved in oil or as dried yeast, the activatability of milk from cows fed in this manner for 2 weeks was no greater than the milk from the normally fed control group, thus confirming the theory that plant sterols are not absorbed by mammals.

Milk-borne diseases, W. M. Scott (*Jour. Dairy Res. [London], 8 (1937), No. 2, pp. 265–274*).—A review of recent findings relating to the epidemiology of milk-borne infections. Forty references to the literature are noted.

The resazurin test: Its use and practicability as applied to the quality control of raw milk, W. D. Barrett, H. Rutan, and J. A. Keenan (*Jour. Dairy Sci., 20 (1937), No. 11, pp. 705–709*).—A comparison of the reduction time of resazurin and methylene blue and a study of the relationship of resazurin reduction to Breed microscopic and standard plate counts on a large number of milk samples led to the following conclusions:

Information obtained on the sanitary qualities of milk through 1 hr. of incubation with resazurin is comparable to that obtained in 7 hr. with the methylene blue test. The resazurin test is the more sensitive to physiologically abnormal and pathological milks and is a valuable adjunct to microscopic diagnosis in eliminating time normally spent in the diagnosis of good milks, thus allowing more time for detecting the source of trouble with poor milks.

The resazurin test: Preliminary studies on its practicalities and possibilities, J. A. Keenan, W. D. Barrett, and H. Rutan (*Jour. Milk Technol., 1 (1937), No. 1, pp. 22–25*).—Essentially the same information is presented as in the above report.

A comparison of the standard with the modified methylene blue reduction technic, H. R. Thornton (*Jour. Dairy Sci., 20 (1937), No. 11, pp. 693–703*).—Studies at the University of Alberta comparing the standard and modified methylene blue reduction technics gave evidence that replicate samples of good milk frequently exhibited serious variations in standard reduction times, and that the variations tended to increase in frequency and magnitude as the reduction time increased. Such variations practically disappeared when

the milk tubes were shaken at intervals during incubation, and the reduction times of such milks were usually shortened. However, the coefficient of correlation between the standard and modified reduction times was so high that there appeared to be little difference in the average accuracies of the two tests. It is concluded that present evidence does not warrant the replacement of the standard methylene blue test by the modified method since the possible greater accuracy of the latter is offset by the greater complexity of the technic.

A comparison of standard plate counts and methylene blue reduction tests made on raw milk with special reference to geometric means, E. D. Devereux (*Jour. Dairy Sci., 20 (1937), No. 11, pp. 719–721*).—The Michigan Experiment Station has analyzed the data from standard plate counts and methylene blue reduction tests of approximately 1,100 samples of raw milk collected at the weigh vats of several commercial dairies. The milks were divided into four classes on the basis of methylene blue reduction tests, and the range and frequencies of plate counts for each class and also the geometric mean and standard deviation are indicated.

About two-thirds of the counts in each class were within one standard deviation of the mean, and over 90 percent of each class were within three standard deviations of the mean of the logarithms. The geometric means of the counts for the four classes of milk were found to be significantly different, and the distribution of the means did not overlap, indicating that the methylene blue test will designate the different classes of milk.

The detection of shedders of the streptococcus of mastitis in composite control milk samples, W. L. Williams (*Jour. Dairy Sci., 20 (1937), No. 11, pp. 711–717*).—The tests described consist of a preliminary incubation of milk samples and subsequent streaking on blood agar. Hemolytic streptococcus colonies are then transferred to litmus milk tubes. Pure cultures having characteristic reactions in litmus milk were then plated on sodium hippurate and esculin broths, and finally β-hemolytic colonies were transferred to both trehalose and sorbitol media to differentiate between human and animal strains. When used routinely in a public health laboratory these tests have provided a satisfactory rapid method for locating dairy herds containing animals with mastitis infections.

The accuracy of the direct microscopic (Breed) count of bacteria and leucocytes in milk, N. J. Strynadka and H. R. Thornton (*Jour. Dairy Sci., 20 (1937), No. 11, pp. 685–692*).—In a study at the University of Alberta, direct microscopic leucocyte counts on replicate 60-field smears from a number of milk samples, ranging in average count from 77,500 to over five million, gave evidence that this is a reasonably accurate method of counting leucocytes in milk, since the high-low ratio of replicate counts in no case exceeded 3 : 1.

Direct microscopic counts of bacteria in 60 and 1,000 fields from each of 22 samples of milk (aseptically drawn from the udder) and of 2,000 fields for nine of the samples showed such a wide ratio between high and low counts as to indicate that the 60-field direct microscopic count is not reasonably accurate as a precise estimate of the number of bacteria in this class of milk. The variation in replicate 6,000-field direct microscopic counts on two low-bacteria milks indicated that 0.01 cc may not constitute a representative sample in this class of milk. It is suggested that the number of fields on which the direct counts in bacteria numbers in milk is based should be reported unless the milk is high in bacterial content.

Influence of dead bacteria on microscopic counts of pasteurized milk, A. R. Ward and C. E. Meyers (*Jour. Bact., 34 (1937), No. 5, pp. 565, 566*).—A comparison of the direct microscopic counts made on raw milk and on the

same milk at short intervals during and after the usual 30-min. holding period at pasteurization temperature led to the conclusion that insufficient numbers of dead bacteria remain visible after pasteurization to impair the usefulness of direct microscopic counts made of pasteurized milk.

A study of oiling off of cream in coffee, H. JENKINS and M. J. MACK (*Jour. Dairy Sci., 20 (1937), No. 11, pp. 723–735*).—A suitable test for measuring the extent to which cream will oil off in coffee, developed by the Massachusetts Experiment Station, is described in this report. Briefly, it consists of measuring 1 cc of well-mixed cream into a skim milk test bottle, adding hot water, centrifuging, and determining the extent of the oil layer.

In a study of the factors which might have a bearing on the problem of oiling off of cream in coffee it was found that separating cream from milk which has been partially frozen, agitation of milk during preheating prior to separation, separating at temperatures above 90° F., and separating milk into cream of more than 45-percent fat, all caused a decrease in the stability of the fat emulsion. Also agitation and heating of cream to a temperature near that of pasteurization, prolonged holding at pasteurizing temperature, pasteurizing temperatures above 145°, partial filling of pasteurizing vats, the use of coil-vat pasteurizers, cooling cream in the pasteurizer, and freezing cream on the cooler, all resulted in a more or less oily separation in the cream. Proper sized centrifugal pumps or steam piston pumps in the plant line did not adversely affect the fat emulsion. Aging cream at low temperature without agitation, shipping in full cans at low temperature, standardizing with milk or skim milk at any common temperature, and storage for 3 days in a household refrigerator were all without detrimental effect in this respect. Cream showing a tendency to oiliness was rendered completely stable by homogenizing at pasteurization temperature, using 500 lb. pressure.

Studies on the neutralization of cream for buttermaking, I–III, F. H. McDOWALL and A. K. R. McDOWELL (*New Zeal. Jour. Sci. and Technol., 18 (1937), Nos. 10, pp. 725–732, 733–738, fig. 1; 11, pp. 818–823, fig. 1*).—Reports of three phases of this study are presented by the New Zealand Dairy Research Institute.

I. *Determination of the pH of cream, butter, and buttermilk.*—Details are given for the pH determination in cream, butter, and buttermilk by colorimetric methods, using either standard buffer solutions or the Lovibond comparator.

II. *Estimation of the titratable acidity of cream.*—A comparison of acidity readings obtained by factory workers and by technicians in the research laboratory on a large number of cream samples indicated a wide range of difference which in some cases amounted to so much as 0.055 percent acidity, thus emphasizing the difficulty of determining the phenolphthalein end point in milk and cream titration. Data are presented on the effect of quantity of indicator on the acidity of milk and cream. It is suggested that the standard indicator strength should be 1 percent of alcoholic solution, and that for cream titration 0.5 cc should be used.

III. *The carbon dioxide content of milk and cream, and the effect of carbon dioxide on the acidity of milk and cream.*—In tests with six cows the CO_2 content of milk anaerobically drawn from the udders ranged from 8 to 13 volumes percent. Approximately 40 percent of the CO_2 in milk was lost during the normal milking process, the loss being slightly greater by machine milking than by hand milking. The average CO_2 content of mixed night and morning samples from 11 cows was 5.8 vols. p. c. Thirty-one samples of mixed factory cream ranged from 1.7 to 16.1 vols. p. c. of CO_2, while 30 samples of individual cream supplies ranged from 1.6 to 24.7 vols. p. c. There was a general correspondence between both the acidity and grade of cream and its CO_2 content, although considerable

overlapping between classes was observed. The effect of CO_2 on the acidity of milks was found to be quite constant, 10 vols. p. c. being equivalent to 0.032 percent of lactic acid, which was approximately 80 percent of the theoretical value of CO_2 taken as a monobasic acid.

Recovery of carotene and vitamin A from butter when cows were fed unlimited quantities of green rye, F. W. Atkeson, J. S. Hughes, B. L. Kunerth, W. J. Peterson, and M. Kramer (*Jour. Nutr., 14 (1937), No. 6, pp. 621–629*).—At the Kansas Experiment Station three dairy cows were fed all the fresh green rye they would consume (average 141.3 lb. per head daily) over a 16-day period.

Determinations during the last 3 days of the trial showed an average daily carotene intake of 3.507 g, equivalent to nearly 6,000,000 international units of vitamin A. The butter produced during this 3-day period contained an average of 4,700 international units of carotene per pound present in the petroleum phasic fraction and 8,490 units of vitamin A per pound present in the nonsaponifiable residues, or a total equivalent to 13,190 international units per pound. On this basis 0.24 percent of the carotene ingested was recovered in the butter. The percentage of vitamin A due to carotene was quite uniform for the three cows, averaging 35.5 percent, indicating that when excessive amounts of carotene are ingested the ratio of carotene to vitamin A in the butter is quite constant at about 1 : 2 for the Holstein and Ayrshire breeds of cattle.

The influence of the type of butter culture and its method of use on the flavor and keeping quality of salted butter, N. E. Fabricius and B. W. Hammer (*Iowa Sta. Res. Bul. 221 (1937), pp. 353–399*).—A range of conditions with reference to the original acidity of cream, time of adding butter culture, methods of using the culture, kind of culture used, and churning acidity was employed in these churning tests. Butter scores were obtained on fresh samples and after varying periods of storage at either 28° or 0° F.

A statistical treatment of the data indicated that certain procedures employed were distinctly advantageous in the production of high-scoring butter. Particularly beneficial results were obtained by the use of a modified butter culture, prepared by inoculating sterile milk with a pure culture of *Streptococcus paracitrovorus* and adding small quantities of sulfuric and citric acids, and by the neutralizing of sweet cream so that a high flavor could be produced through the addition of considerable culture without an excessively acid flavor also being obtained.

Cheese making in Germany, R. S. Breed and J. C. Marquardt (*Farm Res. [New York State Sta.], 4 (1938), No. 2, p. 3, figs. 3*).—A brief résumé of the development and present status of the cheese industry in Germany is presented.

Mould penetration in New Zealand cheese, G. M. Valentine (*New Zeal. Jour. Agr., 55 (1937), No. 2, pp. 89–99*).—This article reports the extent of mold development observed in New Zealand cheeses after shipment to Great Britain and discusses the relation of various practices employed during the manufacturing, curing, packing, and shipping of cheese to the development of this defect.

Oat flour as an antioxidant in ice cream, W. S. Mueller and M. J. Mack (*Ice Cream Trade Jour., 33 (1937), No. 10, pp. 24, 26, 36, 39*).—The Massachusetts Experiment Station found that adding 0.25, 0.5, and 0.75 percent of oat flour to ice cream mixes exerted an antioxidative effect and delayed the development of off-flavors in the ice cream during storage as determined by flavor scores after 1, 2, and 4 weeks of storage, 0.5 percent being considerably more effective than 0.25 percent in this respect. The oat flour also exerted a stabilizing effect in the mix as indicated by the increased viscosity of the mix, the improved

body and texture, and the increased melting resistance of the ice cream. Tests in which the gelatin and serum solids content of the basic mix was reduced gave evidence that the quality of ice cream may be improved by reducing the gelatin content at least 25 percent when 0.5 percent of oat flour is added.

Effect of serving temperature upon consumer acceptance of ice creams and sherbets, W. H. E. Reid (*Ice Cream Rev., 21 (1937), No. 5, pp. 82–86*).—A survey by the Missouri Experiment Station to ascertain consumer preference gave evidence that 10° F. was the most desirable serving temperature for most ice creams and sherbets. Products having a mild flavor and low sugar content were preferred at temperatures above 10°, while those having a higher sugar content and more pronounced flavor were preferred at a lower temperature. The flavors became more pronounced in the ice creams and sherbets as the temperature increased from 6° to 18°. At 6° all products were criticized for being too resistant in body, while at 14° sherbets tended to become soggy and at 18° these criticisms applied to the ice creams.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Colorado Station] (*Colorado Sta. Rpt. 1937, pp. 41–44*).—A brief report is made of the work of the year (E. S. R., 76, p. 532) as to the toxicity of yellow banner (*Thermopsis*) and milk vetch (*Astragalus decumbens*); oat hay poisoning; encephalomyelitis; death losses, vaccination for sore mouth, and parasites of lambs; urinary calculi in cattle and sheep; and Bang's disease of cattle.

[Animal diseases in Tennessee], C. E. Allred, S. W. Atkins, and S. R. Neskaug (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 57 (1937), pp. 170–176, fig. 1*).—This account deals briefly with the losses due to and protective and control work with animal diseases in Tennessee, including tuberculosis eradication and hog cholera, tick eradication, expenditures for animal disease control work, and the relation of animal diseases to human diseases.

Annual report of the veterinary service for the year 1936, R. J. Roe (*Cyprus Dept. Agr. Ann. Rpt., 1936, pp. 29–39*).—An account of the occurrence of and control work with infectious and parasitic diseases of animals is included in this report (E. S. R., 77, p. 244).

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 8 (1937), No. 1–2, pp. 7–356, figs. 41*).—The contributions here presented (E. S. R., 78, p. 100) include the following: Bovine Theileriasis in South Africa With Special Reference to *Theileria mutans*, by G. de Kock, C. J. van Heerden, R. du Toit, and W. O. Neitz (pp. 9–125); Observations on Blue Tongue in Cattle and Sheep, by G. de Kock, R. du Toit, and W. O. Neitz (pp. 129–180); Observations on the Morphology and Life-History of *Gaigeria pachyscelis* Raill. and Henry 1910: A Hookworm Parasite of Sheep and Goats, by R. J. Ortlepp (pp. 183–212); Investigations Into the Transmission of Horse-Sickness at Onderstepoort During the Season 1932–1933, by O. Nieschulz and R. M. du Toit (pp. 213–268); Variation in *Bacillus anthracis*—I, Some Effects of Carbon Dioxide on the Formation of Capsules and Spores by *B. anthracis*, and II, Some Correlations Between Colony Variation and Pathogenicity of Strains of *B. anthracis*, by M. Sterne (pp. 271–349); and *Salmonella bovis-morbificans* (Basenau) From an Outbreak of Food-Poisoning in the Cape Province, by M. W. Henning and E. C. Greenfield (pp. 351–356).

Microbiology in the preservation of animal tissues, R. B. Haines ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest., Spec. Rpt., 45 (1937), pp. IV+85, pls. 3, figs. 29*).—In this report, which briefly summarizes some of the more

important data and indicates lines along which research is moving. part 1 takes up access of bacteria to the tissues (pp. 2–11), part 2 some aspects of the physiology and biochemistry of bacteria and of the tissues of the host (pp. 12–48), and part 3 the control of infection and growth (pp. 49–71). A bibliography of 261 titles is included.

[**Contributions on parasites of animals**] (*Jour. Parasitol., 23 (1937), No. 6, pp. 553–555, 556, 557, 558, 559, 560, 561, 562, 563, 567, 570, 571, 574*).—Among the contributions to the meeting of the American Society of Parasitologists (E. S. R., 77, p. 244) held at Indianapolis, Ind., in December 1937, abstracts of which are presented, are the following: Experimental Transmission of *Toxoplasma* in Canaries, by F. Wolfson (p. 553); Oöcyst Counts for Young Rats on a Basal Diet Supplemented With Various Feeding Stuffs and Experimentally Infected With *Eimeria nieschulzi*, by E. R. Becker (p. 553); Occurrence of Malaria in Young and Adult Red-Wing Blackbirds (*Agelaius phoeniceus phoeniceus*), by C. M. Herman (pp. 553, 554); The Influence of the Host's Rest Period on the Periodic Asexual Reproductive Activity of Avian Plasmodia, by L. A. Stauber (p. 554); Further Studies on *Trichomonas columbae*, by R. M. Stabler (p. 554) (E. S. R., 77, p. 245); Observations on Venereal Trichomoniasis in Bovines, by C. W. Rees (pp. 554, 555); A Strain of *Plasmodium relictum* From Doves and Pigeons, by G. R. Coatney (p. 556); The Effects of Phenylhydrazine on Avian Infections With *Plasmodium cathemerium* (p. 556) and Susceptibility of Young Red Cells in Canaries to Malarial Parasites (pp. 556, 557), both by R. Hegner and R. Hewitt; Transmission Experiments With *Plasmodium circumflexum* and *P. cathemerium* by Mosquitoes, by C. M. Herman (p. 557); The Nature and Mechanism of Local Immunity in Parasitic Infections, by A. C. Chandler (p. 558); Age Resistance of Chickens to the Cestode *Raillietina cesticillus* (Molin), by J. E. Ackert and W. M. Reid (p. 558); Acquired Resistance in Sheep to Superinfection With a Nematode, *Cooperia curticei*, by J. S. Andrews (p. 559); Resistance of Rats and Mice to Infection With *Capillaria hepatica*, by G. W. Luttermoser (pp. 559, 560); Passive Immunity in Experimental Trichiniasis, by J. T. Culbertson and S. S. Kaplan (p. 560); The Immunity to the Hookworm *Ancylostoma caninum* Acquired by Dogs as a Result of Previous Infection, by G. F. Otto, K. B. Kerr, and J. W. Landsberg (p. 560); Immunological Studies With *Dirofilaria immitis*, by J. G. Arnold, Jr., and T. L. Duggan (p. 561); A Parasitological Reconnaissance in Alaska With Particular Reference to Varying Hares, by C. B. Philip (pp. 562, 563); The Larval Production of *Trichinella spiralis* in Rats Given Graduated Numbers of Larvae, by L. O. Nolf and J. M. Edney (p. 567); Some Observations on the Epidemiology of the Dog Heart Worm (*Dirofilaria immitis*), by H. W. Brown (p. 570); Seasonal Changes in the Frequency With Which Single *Strongyloides ratti* Produce Progeny of Indirect Development, by G. L. Graham (p. 570); Infection of Guinea-Pigs With *Strongyloides ratti*, by A. J. Sheldon and G. F. Otto (pp. 570, 571); On the Production and Migration of the Larvae of *Trichinella spiralis*, by L. O. Nolf and J. D. Crum (p. 574); and The Transplantation of Gravid *Trichinella spiralis*, by L. O. Nolf (p. 574).

The identification of Dermacentroxenus rickettsi and its differentiation from non-pathogenic rickettsiae in ticks, H. Pinkerton and G. M. Hass (*Jour. Expt. Med., 66 (1937), No. 6, pp. 729–739*).—Comparative studies were made of the micro-organisms present in the American dog tick, some of which served as a control series while the remainder were exposed to infection with *D. rickettsi* and thereafter maintained under various conditions.

It is concluded from the results of these studies that the nonpathogenic rickettsiae which occur in this tick have no well defined relationship to *D.*

rickettsi, since they differ from the latter organism not only in the absence of virulence and immunizing properties but also in their distribution in tick tissues and inability to multiply in the nuclei of cells.

A disease resembling distemper epidemic among ferrets, E. T. C. SPOONER (*Jour. Hyg.* [*London*], *38* (*1938*), *No. 1, pp. 79–89, fig. 1*).—Material taken from a ferret sick of a disease epidemic among breeders' stock in 1935 was shown to produce a similar disease when inoculated into normal ferrets. The behavior of the experimental disease and its pathology indicated that it was a form of distemper, antigenically related to dog distemper but differing in minor points from canine distemper in the ferret. Associated with the disease was a strain of *Brucella bronchiseptica*, which may have been responsible for the high incidence of bronchopneumonia observed.

An epizootic disease of ferrets caused by a filterable virus, C. A. SLANETZ and H. SMETANA (*Jour. Expt. Med.*, *66* (*1937*), *No. 6, pp. 653–666, pls. 2, figs. 8*).—Report is made (E. S. R., 74, p. 846) of a highly fatal epizootic disease of the respiratory organs of a group of ferrets kept for experimental purposes. It was found that by the use of suitable material the natural disease could be transmitted experimentally, a filtrable virus being the primary causative agent. Secondary invasion by bacteria of the respiratory tract of infected animals frequently occurs, a hemolytic streptococcus being the most important invading organism. There appears to be no immunological relationship between the virus of the ferret disease and the viruses of canine distemper and of human influenza. Histologically the disease is characterized by cytoplasmic and intranuclear inclusion bodies in epithelial cells of many organs. These inclusion bodies are indistinguishable from those occurring in canine distemper.

East Coast fever: Its transmission by ticks in Kenya Colony (*Hyalomma impressum* near *planum* P. Sch. as a vector), W. FOTHERINGHAM and E. A. LEWIS (*Parasitology*, *29* (*1937*), *No. 4, pp. 504–523*).—In the work reported transmission of East Coast fever by the nymphs and adults of *Rhipicephalus appendiculatus*, *R. evertsi*, and *R. simus* has been confirmed. Experiments with the brown dog tick, *R. pulchellus*, and *Amblyomma variegatum* resulted negatively. "The association of *Hyalomma* spp. with many different diseases is briefly dealt with, and it is shown that *H. impressum* near *planum* P. Sch. is capable of transmitting East Coast fever in the nymphal and the adult stages after the larvae and nymphs, respectively, have fed on an infected animal. The parasite does not pass through the egg. *H. impressum* near *planum* is common in most parts of Kenya Colony."

Susceptibility of various mammals to experimental infection with *Fasciolopsis buskii* (Trematoda: Fasciolidae), K. WU (*Ann. Trop. Med. and Parasitol.*, *31* (*1937*), *No. 3, pp. 361–372, pls. 2*).—In the experiments here reported, which were started in 1934, 12 species of mammals were subjected to *F. buskii* infestation and autopsied at different intervals. It was found that practically all helminths develop to maturity in pigs when these are lightly infested. "As far as was ascertained, the worms remain immature in dogs. In rabbits both immature and mature stages of *F. buskii* were met with, and there is a possibility that this host may prove a suitable experimental animal for *Fasciolopsis* work. Immature worms were noted in the young buffalo, but there is not sufficient evidence to say whether they might develop further. The remaining animals (monkey, cats, sheep, goat, ox, guinea pigs, rats, and mice) appear at present resistant to *Fasciolopsis* infection."

Antirabic immunization with culture virus rendered avirulent by ultraviolet light, H. L. HODES, G. I. LAVIN, and L. T. WEBSTER (*Science*, *86* (*1937*), *No. 2237, pp. 447, 448*).—The authors conclude that rabies culture virus, when

exposed to a proper dose of ultraviolet light, becomes avirulent and yet retains enough of its immunizing power to protect mice against 10 intracerebral lethal doses of test virus.

Preservation and purification of dry rinderpest vaccine, T. TOPACIO, A. B. CORONEL, and A. VALENZUELA (*Philippine Jour. Anim. Indus., 4 (1937), No. 5, pp. 379-388*).—In an attempt to preserve and purify the dry rinderpest vaccine by fat extraction with ether, the best results were obtained by treating the vaccine with ether from 1 to 3 times for 30 min. each by simple decantation at room temperature, followed by drying at the same temperature (20° to 30° C.). The keeping quality at room temperature of a potent vaccine treated with ether by simple shaking and decantation was increased from 7 to 18 times that of the untreated material.

The incidence of organisms of the Salmonella group in wild rats and mice in Liverpool, A. M. KHALIL (*Jour. Hyg.* [*London*], *38 (1938), No. 1, pp. 75-78*).—Organisms of the *Salmonella* group isolated from 55 of 750 wild rats trapped in Liverpool were found to be *S. enteritidis* from 24, *S. aertrycke* from 27, *S. newport* from 3, and *S. thompson* from 1. The incidence of these infections was much higher in the winter months, with 17.6 percent, than in the spring or summer, with 4 and 0.4 percent, respectively.

Serological types of Str. agalactiae (Streptococcus group B) in this and other countries, A. W. STABLEFORTH (*Jour. Path. and Bact., 45 (1937), No. 1, pp. 263-277*).—The author finds that the five serological divisions into which most British strains of *S. agalactiae* (*Streptococcus* group B) can be arranged by agglutinin absorption tests fall into three main types, of which two contain related subtypes. "The relation of these types and subtypes in direct slide agglutination tests and in precipitin tests is shown and discussed. There is little cross reaction between main types but considerable cross reaction between subtypes. Precipitin absorption tests, both with whole bacteria and extracts, readily distinguish the main types but not related subtypes. . . .

"The relation of British, American (U. S. A.), and Australian types so far distinguished is discussed, and a scheme is put forward showing this and setting out a new series of designations which it is hoped will facilitate the development of further knowledge regarding the distribution, incidence, and pathogenicity of the various types. . . .

"Attention is drawn to the fact that, though all strains of *S. agalactiae*, and probably most of those called *S. mastitidis*, fall into '*Streptococcus* group B' on the basis of group precipitin tests, certain strains called *S. mastitidis*, and therefore generally regarded as similar to *S. agalactiae*, do not fall into this group. These strains have also certain biochemical characters not regarded as characteristic of *S. agalactiae* by European workers."

Milk-borne streptococcic infections, E. L. STEBBINS, H. S. INGRAHAM, and E. REED (*Amer. Jour. Pub. Health, 27 (1937), No. 12, pp. 1259-1266, fig. 1*).—In an investigation of 1,529 cases of *Streptococcus* infection occurring in seven epidemics in New York State during the period 1934-36, each outbreak was established as milk-borne beyond a reasonable doubt. The source of contamination of the milk supply in six of the seven epidemics was shown to have been a cow suffering from an acute mastitis caused by a hemolytic *Streptococcus* of the type usually associated with human infection, Lancefield's group A (E. S. R., 69, p. 581), and there was at least suggestive evidence of a human source of the bovine infection in each instance.

Collection and preservation for laboratory examination of material suspected of containing Trichomonas fetus, G. DIKMANS (*North Amer. Vet., 18 (1937), No. 9, pp. 24-26, figs. 2*).—While genital trichomoniasis has been

reported from only eight States (California, Iowa, Maryland, New York, Pennsylvania, Texas, Utah, and Wisconsin), it is considered probable that the disease is more widespread than published reports indicate. A description is given of a method for collecting and preserving suspected material in the field, devised by the author to further the diagnosis of the disease.

An experimental study of protective inoculation with heat killed tubercle bacilli, E. L. Opie and J. Freund (*Jour. Expt. Med., 66 (1937), No. 6, pp. 761–788, figs. 5*).—It was found that heat-killed tubercle bacilli repeatedly injected into or below the skin of rabbits increase conspicuously their resistance against infection with virulent tubercle bacilli. Protection against tuberculous infection following the administration of heat-killed tubercle bacilli to rabbits is only slightly less than that given by B. C. G. Addition of certain antigens, notably heated horse serum, increases the protection given by heat-killed tubercle bacilli so that it is approximately the same as that afforded by B. C. G.

The effect of certain volatile halogenated hydrocarbons on the eggs and larvae of nematodes in horse manure, J. T. Lucker and J. M. Schaffer (*Vet. Med., 32 (1937), No. 12, pp. 564–569*).—In the tests reported carbon tetrachloride, ethylene dichloride, a commercial mixture of these two compounds, and a mixture of dichloropentanes were markedly destructive to the vitality of strongyle eggs and preinfective larvae in horse feces when exposed for periods ranging from 23 to 90 hr.

"In feces treated with a mixture of dichloropentanes in the proportion of from about 0.5 to 1 cc of the liquid per 100 g of feces, nearly all eggs or preinfective larvae were killed. A commercial mixture consisting of ethylene dichloride 75 percent by volume and carbon tetrachloride 25 percent by volume, used in similar proportions, was slightly less effective than the dichloropentanes in killing eggs and preinfective larvae. The lethal action of either the dichloropentanes or the mixture of ethylene dichloride and carbon tetrachloride, when used in similar proportions, was less consistent and less effective against infective larvae than against eggs or preinfective larvae. On the basis of one test the mixture of ethylene dichloride and carbon tetrachloride was very effective in killing ascarid eggs in horse feces. Carbon tetrachloride in the proportion of slightly less than 1 cc per 100 g of feces was very effective in killing eggs and preinfective larvae of strongyles; ethylene dichloride was slightly less effective than carbon tetrachloride against the eggs and appeared, on the basis of one test, to be the least effective against preinfective larvae of the four preparations tested. In one test ethylene dichloride, carbon tetrachloride, and the commercial mixture of these two compounds, used in the proportion of 2 cc per 100 g of feces, were highly effective in killing infective larvae."

[**The nomenclature of sulfanilamide (streptocide)**], L. Colebrook, A. W. Purdie, et al. (*Lancet [London], 1937, II, No. 22, p. 1237*).—In this report to the Therapeutic Trials Committee of the Medical Research Council the following nomenclature has been adopted in order to overcome the confusion that has arisen in the introduction of registered trade names of the diazo compounds and *p*-aminobenzenesulfonamide, in particular from the application of the name "Prontosil" to all of these different substances:

"(1) The term sulfamido-chrysoidine will be used for the substance originally designated Streptozon by Domagk (1935), now sold under the registered name of 'Prontosil Red' in this country and 'Prontosil Flavum' in other countries. (2) The term P. S. (because no suitable abbreviation is available) will be used for the soluble diazo compound introduced by Messrs. Bayer Products Ltd. under the name of Prontosil Soluble. (3) The term sulfanilamide will be used for *p*-aminobenzenesulfonamide, as first suggested by . . . Fuller [E. S. R., 77, p. 849] and adopted by the American Council on Pharmacy and Chemistry."

Pharmacological actions of sulphanilamide, F. HAWKING (*Lancet [London], 1937, II, No. 18, pp. 1019, 1020*).—The author has found that sulfanilamide has almost no action on smooth muscle, heart, or blood pressure. When very large doses are given to rabbits or cats it produces nervous symptoms somewhat resembling decerebrate rigidity.

Fluorine intoxication: A clinical-hygienic study, K. ROHOLM (*København (Copenhagen): Nyt Nord. Forlag; London: H. K. Lewis & Co., 1937, pp. XI+364, [pls. 47], figs. [9]; Dan. abs., pp. 322–327*).—Following a brief introduction to this contribution, which is presented with a bibliography of 928 titles, part 1 (pp. 7–108) consists of a review of the role played by fluorine in biology, part 2 (pp. 109–118) describes the technic employed in the author's investigations, and parts 3 (pp. 119–210) and 4 (pp. 211–253) report upon investigations into spontaneous cryolite poisoning and experimental investigations, respectively. Part 5 (pp. 255–315) consists of a discussion and general conclusions.

Vaccination against Bang's disease in an infected dairy herd with United States Bureau of Animal Industry Brucella abortus strain 19, C. M. HARING (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 1, pp. 52–60, figs. 2*).—This contribution from the California Experiment Station on work in a herd of milking cows supplements that conducted in another herd (E. S. R., 78, p. 104).

"Vaccine prepared from strain 19 was used in doses of 100 to 300 billion living organisms on 93 heifers in a dairy herd affected with brucellosis. For a period of 4 yr. the results have been apparently beneficial in retarding the spread of the disease. The association of vaccinated with healthy nonvaccinated cattle did not result in any spread of strain 19 to the latter. The vaccine was also used on 4 cows, and caused a pronounced but temporary drop in milk production. No apparent injury resulted from the vaccination of 3 heifers while between the third and fifth months of gestation. Vaccination during advanced pregnancy of a cow kept in isolation brought about a typical brucellosis, with death of the fetus and discharge of large numbers of the organisms of strain 19 in uterine material at the time of parturition. . . .

"At present the herd consists of 65 milking cows, 49 of which have been vaccinated as calves or heifers. Only 10 cows in the herd now have an agglutination titer of 1:100 or above. Nine of these are young vaccinated cows. The tenth is [an] old nonvaccinated cow . . . retained when other shedders were discarded, and if she is found to be still harboring *B. abortus* she will serve to continue this exposure trial of testing the resistance to *Brucella* infection conferred by the vaccination of heifers with strain 19.

"As a result of association with the old infected nonvaccinated cattle, 1 of the vaccinated heifers shed virulent *B. abortus* (not strain 19) in the uterine material at the time of her first calving. She gave birth to a full-term, vigorous calf, and her agglutination titer remained negative. Another heifer, apparently as a result of infection previous to her vaccination at the age of 2 yr., has shed virulent *B. abortus* (not strain 19) in the milk after each of three normal parturitions in which she produced vigorous calves."

Blackleg prevention, J. P. SCOTT (*North Amer. Vet., 18 (1937), No. 7, pp. 30–36*).—A practical contribution on vaccination against blackleg, which is primarily a disease of cattle between 6 mo. and 2 yr. of age and due to *Clostridium chauvei*. It may occur in sheep, in which it is caused either by *C. chauvei* or *C. septicum*, and in swine, in which it is caused by *C. septicum*.

Group classification and serological typing of streptococci associated with bovine mastitis in Australia, D. F. STEWART (*Jour. Path. and Bact., 45 (1937), No. 1, pp. 279–293*).—A report is made on 54 strains of streptococci isolated from milk samples from various parts of New South Wales which were

examined by biochemical and group precipitin technics. Fifty-one were identified as *Streptococcus agalactiae*. Twenty-one other strains were shown to be of the same nature by group precipitin tests. The contribution is accompanied by a list of 35 references to the literature.

On a new species of Stephanofilaria causing lesions in the legs of cattle in the Malay Peninsula, J. J. C. BUCKLEY (*Jour. Helminthol., 15 (1937), No. 4, pp. 233–242, pls. 2, figs. 8*).—Under the name *S. kaeli* a form extracted from lesions from the lower parts of the legs of cattle in Kuala Lumpur is described as new to science. A comparison is made of the species of the genus; and a Report on the Histo-pathology of a Stephanofilariasis Lesion, by G. R. Cameron (pp. 234–236), is included.

Development of local cellular reaction to tuberculin in sensitized calves, W. H. FELDMAN and C. P. FITCH (*Arch. Path., 24 (1937), No. 5, pp. 599–611, figs. 10*).—Report is made of a histologic study by the Minnesota Experiment Station and Mayo Foundation, cooperating, of the tissue changes which followed subcutaneous injection of tuberculin into nine sensitized calves that were infected with bovine tubercle bacilli. "After the lapse of 58 days, the usual diagnostic dose of mammalian tuberculin was injected into the derma of each caudal fold of each calf. Starting at the third hour after the tuberculin was introduced, and continuing at intervals to the twenty-eighth day, portions of the respective caudal folds were removed for biopsy.

"The essential histologic features can be summarized as follows: The reactive process gave evidence of a constant predilection for the perivascular and perineural tissues. During the early phases of the reactive process polymorphonuclear leucocytes were numerous. Eosinophilic granulocytes and histiocytes were in the minority. A histiocytic or mononuclear cellular reaction gradually replaced the polymorphonuclear leucocytes and dominated the picture, beginning at the sixtieth or the seventy-second hour. Edema appeared early in the reaction and disappeared between the fifth and seventh days. Certain endovascular changes, including thrombosis and endarteritis, occurred. Resolution of the cellular reaction had not occurred after 28 days.

"The injection of tuberculin into the skin of nonsensitized calves failed to provoke demonstrable changes."

Our present knowledge of two common diseases of sheep—infectious enterotoxaemia and internal parasites, C. T. MCKENNA (*Jour. Dept. Agr. So. Austral., 41 (1937), No. 3, pp. 264–271, figs. 3*).—A summary is given of the present knowledge of infectious enterotoxemia and of internal parasites of sheep, with special reference to the preventive measures adopted as a result of the experimental work conducted.

An investigation of severe losses from abortion in ewes, A. M. LEE and L. H. SCRIVNER (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 1, pp. 68–72, fig. 1*).—A report is made of abortion encountered in northwestern Wyoming in which approximately 500 in a flock of 1,050 ewes aborted. An organism was consistently isolated from the field material which would reproduce abortion experimentally in pregnant ewes. A study of the morphological, cultural, and physiological characteristics of the organism by the Wyoming Experiment Station indicated that it has never been reported. It is considered that the disease is spread by means of vaginal discharges.

The experimental production of cutaneous myiasis of sheep, J. MACLEOD (*Parasitology, 29 (1937), No. 4, pp. 526–529*).—A description is given of a method by which active cutaneous myiasis of sheep by *Lucilia sericata* can be produced with certainty and precision at any season of the year. The method is such that it can readily be employed in field experiments.

The distribution of nematodes in the small intestine of the sheep, J. H. TETLEY (*New Zeal. Jour. Sci. and Technol.*, *18* (*1937*), *No. 11*, *pp. 805–817*, *figs. 5*).—In examinations made of the distribution of species of nematodes in the small intestine of sheep during the years 1931–35, inclusive, they were found in greatest numbers in the jejunum. "It is concluded that the site of infection of species in the small intestine is determined by the rate of response of incoming larvae to stimuli contained in the contents of the small intestine. The stimuli causing the larvae to take up their station are present in some degree in the abomasum, but on entry of larvae to the duodenum the stimuli function with increased potency. It is concluded that secretions poured into the duodenum, the bile or the pancreatic juice or both, play a part in providing the stimuli in the small intestine. The origin of the stimuli in the abomasum was not indicated. However, it is apparent that pH alone is not of significance. The cause of atypical distribution was not established, but the agency or agencies involved did not act with equal potency on all species present in the small intestine of the host."

Natural helminthiasis of the goat involving infection with Trichostrongylus retortaeformis of the rabbit, J. W. G. LEIPER (*Vet. Rec.*, *49* (*1937*), *No. 45*, *pp. 1411, 1412*).—Record is made of the natural occurrence in the goat of infections with *T. retortaeformis*, a parasite normally found in large numbers in wild rabbits and hares in England. Young goats were found to be susceptible to experimental infection with *T. retortaeformis* of the rabbit. The housing and good feeding of heavily infected goats helps in the throwing off of heavy gastrointestinal helminthic infections.

Swine diseases in western Canada, E. A. WATSON (*Sci. Agr.*, *18* (*1937*), *No. 1*, *pp. 22–31*).—This discussion is based upon a recent survey.

Brucella infection (infectious abortion) of swine in the Philippines, T. TOPACIO (*Philippine Jour. Sci.*, *63* (*1937*), *No. 3*, *pp. 265–279*, *pls. 4*).—This contribution, noted from another source (E. S. R., 78, p. 400), is accompanied by a list of 12 references to the literature.

Studies on Erysipelothrix rhusiopathiae, with special reference to smooth and rough type cultures, H. W. SCHOENING, W. S. GOCHENOUR, and C. G. GREY (*Jour. Amer. Vet. Med. Assoc.*, *92* (*1938*), *No. 1*, *pp. 61–67*, *figs. 2*).—A report is made of studies conducted in continuation of those previously noted (E. S. R., 75, p. 101), in which it was pointed out that the causative agent of swine erysipelas produces two types of colonies, smooth and rough, and that for the preparation of satisfactory antigens for the agglutination test the use of smooth-type cultures was necessary.

"Cultures on primary isolation are principally smooth-type colonies. Old stock cultures are almost entirely rough-type colonies. Factors influencing change in colony formation are type of media, pH of media, and time interval between transfers. Smooth cultures are the most satisfactory for the production of agglutinating fluid. A method for the preparation of agglutinating fluids is given. Smooth cultures are regularly virulent for mice and pigeons, while rough cultures are avirulent. In limited tests on swine, however, smooth cultures failed to infect. Rough cultures, while avirulent for laboratory animals, produce immunity to subsequent inoculation with smooth virulent cultures."

Necrotic enteritis of young pigs not associated with Salmonella infection, A. D. MCEWEN (*Vet. Rec.*, *49* (*1937*), *No. 48*, *pp. 1507–1509*).—This is a report upon the occurrence of necrotic enteritis of young pigs in a herd where hog cholera was unknown and where *Salmonella* bacteria could not be incriminated as the cause. The disease has been found to be the most serious of those

occurring in recently weaned pigs. It is not associated with any specific bacterial infection, nor with parasitic worm infestation or infestation with coccidia.

Internal parasites of swine, B. SCHWARTZ (*U. S. Dept. Agr., Farmers' Bul. 1787 (1937), pp. II+46, figs. 38*).—A practical account of the endoparasites of swine, their prevention and control.

Observations on canine spirochetosis in Connecticut, E. JUNGHERR (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 6, pp. 661–673, figs. 10*).—Laboratory findings in an outbreak of infectious jaundice in a Pointer kennel, in which 41 out of 42 young dogs succumbed, are reported upon in this contribution from the [Connecticut] Storrs Experiment Station. It appears to be the first reported case of this canine disease in the United States, the epizootological data indicating an infection with *Leptospira icterohaemorrhagiae*, although the comparatively low virulence for guinea pigs pointed to *L. canicola*.

The contribution is accompanied by a list of 34 references to the literature.

Hemolytic streptococci in chronic peritonitis and salpingitis of hens, P. R. EDWARDS and F. E. HULL (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 6, pp. 656–660*).—A chronic infection of hens due to hemolytic streptococci is reported upon in this contribution from the Kentucky Experiment Station.

"The only constant pathological changes noted on post-mortem examination were exudative peritonitis and salpingitis accompanied by the presence of concretions in the oviduct. The streptococci, which were sorbitol-fermenting strains of Lancefield's group C, were capable of producing death in hens when injected intravenously or intraperitoneally or when instilled into the nasal passages."

Dietary control in experimental coccidiosis, E. R. BECKER (*Science, 86 (1937), No. 2235, pp. 403, 404*).—The three experiments here reported and others conducted by the author are considered to have proved that coccidiosis is a disease controllable through the diet. "It appears that the extreme severity manifested in certain outbreaks is attributable not only to the micro-organism but also to certain of the materials incorporated into the ration to stimulate growth of the bird. Powdered skim milk and buttermilk in certain formulas for chick rations seem to be the most flagrant offenders in this regard. Too many wheat middlings are under suspicion also. The cardinal problem in coccidiosis control is to construct a ration that is adequate in vitamin and vitaminlike materials for the normal development of the host but at the same time lacks inordinate coccidium-stimulating properties."

Fowl leukosis, E. L. STUBBS (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 1, pp. 73–82, figs. 2*).—In reporting upon experiments with fowl leucosis, it is pointed out that it occurs in several different types, some of which have been shown to be transmissible while others are not well understood. The experiments reported indicate that the strain studied is a pure strain and has only the ability to stimulate the hematopoietic tissues to abnormal activity. A list is given of 19 references to the literature.

Listerella infection in fowls: Preliminary note on its occurrence in East Anglia, J. S. PATERSON (*Vet. Rec., 49 (1937), No. 49, pp. 1533, 1534*).—The author reports having recovered organisms of the *Listerella* group from a series of fowls on four occasions. The report of Seastone (E. S. R., 77, p. 696) is said to be the only other record of the occurrence of this group of organisms in poultry. The following general features were observed:

The adult fowls died suddenly, while in young stock there was gradual wasting. On post-mortem examination there was a general edematous condition of the carcass, and the abdominal cavity and pericardial sac usually contained

much excess fluid. The occurrence of areas of necrosis in the liver was commonly found. In one case (a cockerel) there was extensive necrosis of the myocardium. *Listerella* was recovered from the liver of every bird examined (25 in all) and from the heart blood in 7 cases.

Seventeenth annual report on eradication of pullorum disease in Massachusetts, V. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul. 88 (1937), pp. 11*).—The results of pullorum disease testing for the season 1936–37 are presented in this further report (E. S. R., 76, p. 107). The details of the work are summarized in tables.

The results show marked increases in the number of tested flocks, tested birds, and tested samples. Along with the expansion in turkey production by means of artificial methods, the pullorum disease outbreaks in turkeys increased in number, in all cases occurring in young poults. Among the 118 turkeys tested, 28.81 percent exhibited reactions which varied in degree, with a maximum titer of 1:320. In most cases the origin of the infection could be traced to an incubator or brooder house which was or had been occupied by pullorum-infected chicks. Spontaneous cases of pullorum infection traceable to adult turkey breeding stock have not been observed. It is pointed out that young poults are readily susceptible to the disease, which behaves similarly to that in young chicks, and that those which survive the outbreak may remain carriers of the infection. Such turkey carriers exhibit an apparently normal physical condition, but on necropsy *Salmonella pullorum* may be recovered.

Observations on a highly fatal virus disease of fowls from east Africa, J. R. HUDSON (*Vet. Jour., 93 (1937), No. 10, pp. 356–368, figs. 2*).—A report is made of a filtrable virus disease of fowls new to east Africa which closely resembles Newcastle disease.

Localized pullorum infection in the ovary of a duck, F. R. BEAUDETTE (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 1, pp. 100, 101*).—A case report is made of a 2-year-old Muscovy duck received at the New Jersey Experiment Stations in which localized pullorum infection was found in the ovary. This is considered to be the first record of such infection in an adult duck. Reference is made to the contribution of Hinshaw and Hoffman (E. S. R., 77, p. 706) on pullorum infection in ducklings.

Studies on blackhead.—I, Morphology, development, and pathogenicity of causal agent in body of host; II, Mode of infection, D. NIIMI (*Jour. Japan. Soc. Vet. Sci., 15 (1936), No. 1, pp. 58–119, pls. 5, Eng. abs. pp. 15–19; 16 (1937), No. 2, pp. 183–239, pl. 1, Eng. abs. pp. 23–26*).—The author's investigations conducted at the Kitasaku Agricultural School, Nagano Province, have led to the conclusion that the cecum worm *Heterakis papillosa* is the true vector and reservoir host of the blackhead organism studied in Japan, which appears to differ in some respects from *Histomonas meleagridis*. The causal organism first enters the intestinal tract, particularly the ceca, multiplies therein rapidly, then penetrates the mucosa, and may be carried by the blood stream to the liver.

When the chicken or turkey is fed experimentally with the organism, which is in the free state, in the incubation or infective periods, none of the experimental fowl develop the disease, although chicks less than 10 days old do at times become infected by such feeding inoculation. Nor do experimental normal birds that have been placed and fed in the same cage with infected birds take the disease if none of the birds harbor the worm. The organism, which passes from the bird's ceca in the droppings, dies outside the body within 5 days without taking on any permanent form. As a result, direct infection with the organism occurs very rarely or not at all.

When present in the cecal content of the bird the causal organism gains entrance to the body of the cecum worm through ingestion, reaches the lumen of its intestine, passes through the wall, and appears in the body cavity. In an adult female worm the causative agent invades the ovaries and at last the eggs. Such eggs, infected with the causative organism, become full-grown eggs in the course of time, and, harboring the causative agent of blackhead, pass through the oviduct and uterus while being laid. Since it may survive in the worm's eggs longer than 1 yr., perhaps for from 3 to 4 yr., ingestion of infected eggs is the principal means of its spread.

It is considered to have been definitely shown that blackhead is contracted only through the ingestion of the infected eggs of this helminth and not by ingestion of the causative agent in its free state, *H. papillosa* being the intermediate host of the causal organism of blackhead and not merely a mechanical transmitter.

Modifications of the Rous-Turner solution for preservation of bird erythrocytes, A. Golden and M. R. Irwin (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 234–236*).—A contribution from the Wisconsin Experiment Station in which a summary of the length of preservation of erythrocytes from different species of birds in various solutions is given in table form.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Colorado Station] (*Colorado Sta. Rpt. 1937, pp. 27, 38, 39*).—Progress results are briefly presented of investigations of sugar beet harvesting machinery, tests of an adjustable tube orifice meter, and the use of a single vortex tube sand trap.

The tile drainage experiment (*Indiana Sta., Jennings Co. Expt. Field Rpt. 1921–36, pp. 6, 7*).—Comparisons of different distances and depths are tabulated.

AGRICULTURAL ECONOMICS

Report of the Chief of the Bureau of Agricultural Economics, 1937, A. G. Black (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1937, pp. 21*).—The types of investigations conducted during the year ended June 30, 1937, are described briefly and some results given of the studies of farm income; farm mortgage indebtedness; production costs; agricultural adjustment; farm population; land economics; foreign markets; foreign agricultural conditions and developments; income parity for agricultural prices; prices of agricultural products; distribution methods; cotton prices; marketing and grading and new uses for cotton; grain, hay, feed, and seed standards; livestock markets and grades; fruits and vegetables; etc. The crop and livestock estimates, information, inspection, and outlook work of the Bureau and its work in the administration of the Cotton Futures, Cotton Standards, Federal Seed, Perishable Agricultural Commodities, Standard Containers, Warehouse, and other Acts are described.

[Notes on agricultural economics] (*Jour. Farm Econ., 19 (1937), No. 2, pp. 636–654*).—Included are notes on A System for Quantity Discounts on Milk and Cream, by P. E. Quintus (pp. 636–639); Establishment of Ohio Students of Vocational Agriculture in Farming, by H. G. Keuestrick (pp. 639–642); Sugar Beet Field Labor Under the AAA, by W. T. Ham (pp. 643–647); Whither—Lending to Farmers for Production Purposes, by C. J. Bradley (pp. 648–650); and Government Establishment of Small Farms in England and Scotland, by E. Whittaker (pp. 650–654).

[Investigations in agricultural economics by the Colorado Station, 1936–37] (*Colorado Sta. Rpt. 1937, pp. 51–53*).—Included are (1) brief con-

clusions as to advisable agricultural adjustments, arrived at in an analysis of the economic conditions affecting Routt and Moffat Counties in the northwestern part of the State and Logan, Phillips, and Washington Counties in the northeastern part of the State, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, Forest Service, and Soil Conservation Service; and (2) findings as to the percentage of long-time credit furnished farmers by Federal loaning agencies in the plains area and mountain counties of the State.

Current Farm Economics, [December 1937] (*Oklahoma Sta., Cur. Farm Econ., 10 (1937), No. 6, pp. 109–140, fig. 1*).—Included are the usual tables of price statistics and articles as follows: Factors to Be Considered in Framing Agricultural Legislation, prepared by the staff members of the department of agricultural economics and sociology and rural life of the Oklahoma Experiment Station (pp. 110–120); Land Use Adjustments for Oklahoma, by J. Salisbury, Jr. (pp. 120–124); Where to in Farm Tenancy? by O. D. Duncan (pp. 124–128); and The Agricultural Situation for 1937–38, with sections on Demand and Price (pp. 128, 129) and Feed Supplies (pp. 130, 131), both by T. R. Hedges, Hogs, by P. Nelson and H. Little (pp. 131–133), Sheep Lambs, and Wool (pp. 133, 134) and Beef Cattle (pp. 135, 136), both by A. W. Jacob, Poultry and Eggs, by H. A. Miles (p. 135), and Dairy, by A. L. Larson (p. 137).

[Farm economics in Great Britain] (*Farm Econ. [Oxford Univ.], 2 (1937), Nos. 5, pp. 73–92, figs. 3; 6, pp. 93–116, figs. 4; 7, pp. 117–136*).—These publications continue the series previously noted (E. S. R., 77, p. 711). No. 5 includes articles on The Changing Organization of Arable Farms, by R. McG. Carslaw and P. E. Graves (pp. 73, 74); Trends in Grassland Dairy Farming, by E. Thomas (pp. 75, 76); Housing as a Factor in Pig Production, by A. W. Menzies-Kitchin and S. Taylor (pp. 77–79); Costs of Erecting Fattening Houses for Pigs, by C. V. Dawe and P. J. O. Trist (pp. 80–82); Seasonal Egg Production and Culling, by J. R. Lee (pp. 82, 83); and Some Points on the Costs of Handling Straw on Mechanized Farms, by E. P. Weeks (pp. 84–87). No. 6 includes Income and Expenditure on 30 Mixed Farms in Wiltshire and Somerset, by C. V. Dawe and L. J. Hewett (pp. 93, 94); Movements in Output and Expenses on 21 Mixed Farms in Mid-Devon, by R. Henderson (pp. 95, 96); The Productivity of Grassland on a Midland Farm, by R. P. Askew (pp. 97–100); The Condition of Farm Buildings, by R. McG. Carslaw and P. E. Graves (pp. 101, 102); The Cost of Milk Rounds in Relation to Their Density and the Type of Area Served, by J. Cripps (pp. 103–107); The Outlook for Egg Production, by O. J. Beilby (pp. 108–110); and The Increase in Food Imports in 1936, by R. L. Cohen (pp. 110–112). No. 7 includes The Effect of the Proposed Modification to the Wheat Act on Farmers' Returns, by R. L. Cohen (pp. 117–120); Recent Changes in Output and Expenditure on Some Yorkshire Farms, by W. H. Long and C. M. Brayshaw (pp. 121–123); Cost of Fattening 14 Devon Bullocks, by E. C. Millar (pp. 123–126); Pre-weaning and Post-weaning Mortality in Pig Production, by A. W. Menzies-Kitchin (pp. 126–129); The Future Changes in the Number of Horses in England and Wales, by R. P. Askew (pp. 129–133); and Disposal of the Wool Clip, by S. T. Morris (pp. 134–136).

Foreign Agriculture, [December 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), No. 12, pp. 587–636, figs. 3*).—Included are articles on The Japanese Cotton-Textile Industry and American Cotton, by W. Ladejinsky (pp. 589–618); The Brazilian Coffee-Defense Experiment, by E. P. Keeler (pp. 619–626); and Effect of Subsidies on British Wheat Acreage and on Returns to Growers (pp. 627–630); and notes on recent developments in foreign agricultural policy as follows: Netherlands considers reducing aid to farmers, Danube

Basin relief to wheat and rye growers, Swiss wheat and flour trade regulations, and German chemical process for improving heavy-grade tobacco.

References on economic history as a field of research and study, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 31 (1936), pp. V+83*).—This is a list of 131 references with notes showing contents to be noted, comments, and reviews. The references are grouped under the headings of economic history as a field of research and study, economic interpretation of history, and periodicals devoted to economic history. A chronology "indicates the general development of economic history as a formally recognized field of research and study during the last 40 or more years."

References on agricultural history as a field for research, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 32 (1937), pp. V+41*).—"This bibliography pertains to agricultural history as a field for research and study. Special attention has been given to references on the scope and significance of American agricultural history, references that relate to sources of special interest to research workers in agricultural history and the steps that are being taken to collect these sources, and references that describe special methods of research utilized by agricultural historians." Seventy-five references with comments are listed. A list is also included showing "the chronological development of interest in agricultural history in the United States."

Significant changes in agriculture of northeastern highland rim, C. E. Allred and A. C. Robison (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 61 (1937), pp. [1]+II+41, figs. 25*).—This is a study of the changes in agriculture in Overton County, selected as representative of the area, which "due to distance from market, lack of transportation facilities, rough topography, and the absence of especially well adapted agricultural enterprises for commercial production, . . . developed from the first a self-sufficing type of agricultural program." The changes are discussed in sections on early history, land area, number and size of farms, value of farms and machinery, different kinds of livestock, dairy products, bees, and different crops. The period covered is usually from 1880 or 1890 to 1934 or 1935, but in some cases extends back to 1840. A comparison is made of the tenure, land use, crops, yields, number of head of livestock of different kinds, sources of receipts, income, etc., on the same farms in 1926 and 1936.

Changes in the economic organisation of agriculture: A comparative study of conditions in the eastern counties of England in 1933 and 1935, 1935 and 1936 (*Cambridge Univ. Dept. Agr., Farm Econ. Branch Rpt., 23 (1936), pp. IV+36, figs. 4; 24 (1937), pp. VI+38, fig. 1*).—These reports are the first of a series on the financial and quantitative changes in the agriculture of the eastern counties of England. No. 23 compares data from 220 farms for the years 1933 and 1935 and No. 24 data from 200 farms for the years 1935 and 1936. Appendixes in each report include financial and economic data, monthly prices of livestock, livestock products, different crops, feeds, etc., and a table shows the average monthly rainfall. No. 24 also includes a summary of report No. 23.

Rural zoning: A monograph (*New England Region. Planning Comn. Pub. 49 (1937), pp. [4]+76, pls. 4, figs. 11*).—"This monograph provides a basis for discussion and study of rural land use problems and a possible approach to the solution of those problems." The economic reasons and legal basis for rural zoning are described. The rural zoning legislation of Wisconsin and the experience in that State and other States with rural zoning are briefly described. The rural problems in each of the New England States are discussed.

Land classification in West Virginia based on use and agricultural value, G. G. Pohlman (*West Virginia Sta. Bul. 284 (1937), pp. 31, figs. 13*).—The soil,

climatic, economic, and social factors affecting the agricultural value and use of land in the State are briefly described. The method of evaluating the physical factors—slope, erosion, soil series and types, description and general grouping of soil series, and fertility index—in the classification of the lands of the State is described and discussed. On the basis of the soil, climatic, and economic factors the lands are grouped into eight classes, and the location, extent, character, present and possible agricultural uses, etc., of the land in each class are described. Tables show the prevailing land slope classes and distribution of lands by classes by counties, and the relationship of fertility, slope, and erosion to land class and use. A general erosion map of the State is included. General slope, soil, and land class maps of the State were prepared and published in the bulletin noted below.

The percentages of the lands of the State allocated to the different classes were: Superior agricultural land 1.46, good crop land 2.32, average crop land 3.36, below-average crop land or good pasture land 9.13, inferior crop land or average pasture land 30.66, submarginal land 20.53, forest land 31.83, and urban and industrial land 0.71.

Land-class maps of West Virginia.—I, Land classification; II, slope of land; III, types of soil, G. G. POHLMAN (*West Virginia Sta. Bul. 285 (1937), maps 3*).—This bulletin consists of three State maps showing (1) lands with slopes of 0–12, 12–25, 25–40, and over 40 percent; (2) soil groups; and (3) the lands in the different classes described in the bulletin noted above.

Willamette Valley project: A regional plan (*[Portland]: Oreg. State Planning Bd., 1936, pp. [10]+161, [pl.] 1, figs. 25*).—This report outlines a regional plan for development of the resources of the Willamette drainage area. Part 1 describes the physiography and topography, soils, mineral resources, climate, ground water, natural cover, and run-off. Part 2 deals with the population, agriculture, forestry and lumbering, manufacturing industries, and commerce and transportation. Part 3 discusses and makes recommendations regarding the immediate problems of the waters, land use, forest, mineral industries, manufacturing and commerce, and social conditions.

Profitable systems of farm and ranch organization for dry land areas of Wyoming, A. F. VASS (*Wyo. Agr. Col., [1936], pp. [20]*).—This paper, presented at the 1936 annual meeting of the Western Farm Economics Association, outlines plans of organization, with estimated expenses and returns, for a 3,840-acre cattle and wheat ranch, a 6,400-acre cattle ranch, and a 6,400-acre sheep ranch.

Relation of fertilization and selling price to profitableness in cotton production, C. B. WILLIAMS (*North Carolina Sta. Bul. 313 (1937), pp. 16, figs. 6*).—Tables show the acreage yields and returns per acre above cost of producing, harvesting, and ginning with seed cotton at 2.5 ct., 5 ct., and 8 ct. per pound (1) in 13 fields representing 11 different types of soil during several years without fertilizer but under proper cultivation, and (2) on experimental fields where different amounts of fertilizer were used on Norfolk sandy loam, Cecil clay loam, Norfolk loamy sand, and Appling sandy loam soils, and on 13 other outlying fields representing 11 types of soil in the Coastal Plain and Piedmont areas on which complete fertilizers were used. The findings are summarized as follows:

"Without fertilization, when the selling price of seed cotton (seed and lint) is no higher than 2.5 ct. per pound, its growth will usually be done at a considerable loss on dominant Coastal Plain and Piedmont soils, the least loss occurring on those more productive soils of the Marlboro, Greenville, Norfolk, and Ruston sandy loam types. With fertilization, the selling price of seed cotton being 2.5 ct. per pound, the growth of cotton is usually done at less than cost of produc-

tion. With typical soils of the Coastal Plain and Piedmont regions used in cotton growing, the most profitable applications are usually the ones varying from 600 to 1,200 lb. per acre of suitable fertilizer mixtures, provided the selling price of cotton is the equivalent to 5 ct. or more per pound for seed cotton. Cotton grown on Marlboro, Greenville, Ruston, and Norfolk sandy loams in a fairly high state of productiveness gave greater net returns from fertilization, both at 5 and 8 ct. a pound for seed cotton, than when grown on the same and other types of soil in a less productive state."

[Staple length of cotton produced in Georgia from 1927–28 to 1936–37] (*Georgia Sta. Rpt. 1937, pp. 7, 8*).—Progress during the period is briefly noted.

Cotton goes to market: A graphic description of a great industry, A. H. Garside (*New York: Frederick A. Stokes Co., 1935, pp. XX+411, [pls. 49, figs. 14]*).—"The purpose of this book is to give a broad picture of the marketing of American cotton. . . . Those entering the cotton business will find that this book provides them with a basic knowledge of it, while those of more experience in the trade may find it useful in rounding out their knowledge of how American cotton is merchandised throughout the world. The book is intended, also, to provide a graphic description of the cotton trade for those who are only indirectly interested in it, such as bankers and dealers in cotton goods, and for business and public leaders who desire to acquire a thorough understanding of how the leading cash crop of the United States is marketed."

Stabilizing corn supplies by storage, G. Shepherd and W. W. Wilcox (*Iowa Sta. Bul. 368 (1937), pp. 293–344, figs. 20*).—The nature and geographical differences in the fluctuations in the size of the corn crop; the importance of corn as a feed crop; past storage by individuals; costs of storage; the effects of size of corn crop upon hog production; the relation of hog supplies, prices, and total income; effects of a corn storage program on the price of cash corn; the effects of fluctuating corn prices on hog production costs; and the fluctuations in the production of livestock other than hogs and other phases of the problem are discussed. The factors determining hog prices and corn prices, and the effects of corn loans on stability of total income are analyzed and discussed in appendixes.

The cost of storing corn was found to be 3 ct. per bushel per year. With a stabilization program providing for the storage of 20 percent of very large crops, the cost would be only ⅗ ct. per bushel on the total crop. The benefits of stabilization of the supply of corn are summarized as follows:

"Livestock production, prices, and total income would be stabilized. The value of this stabilization cannot be measured in dollars and cents, but with our present highly commercialized farming and heavy fixed costs, it is without question one of the more important benefits. Total income from hog and cash corn production would be raised slightly, in the neighborhood of 1 percent. (This increase in income alone would more than offset the costs of storage of the excess corn supplies—assuming no change in demand.) Hog production costs would be lowered by a small amount (2 to 3 percent) through a more complete utilization of overhead costs and perhaps that much more through the adjustment of feeding operations so that a large percentage of the hogs would be marketed at optimum weights. Other livestock production costs for the same reasons would be lowered slightly. The overhead costs of transporting, processing, and distributing a more uniform supply of livestock and livestock products would be lower by several percent. Consumers would have a more uniform supply of meat and livestock products—more when there otherwise would be a relative scarcity, less when market supplies would

otherwise be burdensome. Taken all together, the benefits appear to be several times greater than the costs."

Marketing potatoes in Michigan, with special attention to market preferences, G. N. Motts (*Michigan Sta. Spec. Bul. 288 (1937), pp. 68, figs. 12*).—The importance of potato production in Michigan and its relation to national production, the production areas of the State, varieties grown, cultural methods, storage, etc., are described. The sales outlets, grading, inspection, packages and handling, market movements, receipts from other States, apparent consumption of potatoes in the State, market costs, etc., are discussed. The data for production and marketing covered the seasons from 1922-23 to 1936-37, inclusive. An analysis is also made of data regarding marketing preferences obtained through questionnaires returned by 75 Detroit housewives, by produce buyers of 3 large chain grocery companies and 130 independent grocers in Detroit, by 71 restaurant operators in Detroit, and by 60 hotels in Michigan and other States. Comparisons are made of the farm, Detroit terminal, and other city market prices of Michigan potatoes and potatoes from Wisconsin, Minnesota, Maine, and Idaho. Fifty samples each of Michigan, Maine, and Idaho potatoes purchased in the Detroit market were compared for size, defects, grade, pack, conditions and appearance, and cooking quality. The cooking tests were made by R. M. Griswold. Baked and boiled potatoes were scored as to color, mealiness, flavor of mashed flesh, and general conclusions. The boiled potatoes were also scored as to sloughing of skin. Suggestions are made as to production and marketing practices and operations.

Michigan ranks fourth among the 18 surplus late-potato States of the United States, with an average annual production of 25,610,000 bu. During the 1924-35 seasons an average of 55 percent of the potatoes grown was sold by the growers, 20 percent used in their homes, 15 percent kept for seed, and 10 percent fed to livestock or wasted. Of 294 growers reporting sales outlets, 50 percent used only 1 outlet and 35 percent only 2 outlets. Of the group, 39 percent sold some potatoes to consumers at the farm, 46 percent made some farm sales to truckers, 20 percent used public markets to some extent, and 5 percent engaged in door-to-door selling. When sold in wholesale lots, 100-lb. bags were generally used. About one-fifth of the potatoes produced, or one-third of the amount sold by farmers in the State, is marketed in other States. Between 1929 and 1935 the volume of Michigan inter-State shipments exceeded receipts from other States by an average of nearly 1,700,000 bu. per year. Approximately 85 percent of the potatoes used in the State were grown within the State. Detroit consumers preferred a medium-sized (2.5-in. diameter), oval-shaped potato. About two-thirds preferred a white skin and one-third russet varieties. Of the consumers, 75 percent were willing to pay a somewhat higher price for these characteristics. Hotels and restaurants preferred a larger potato (from 3- to 3.25-in. diameter) and had a less marked preference as to shape.

"Although the best Michigan potatoes are probably equal to the best from other late-crop States, a comparison of 50 test samples from each of the States of Michigan, Maine, and Idaho indicates that the Michigan potatoes sold in Detroit are not as satisfactory to consumers as those from the other two States. Differences in the kind and amount of defects present were more important than differences in size. Consumers paid an average of 44 ct. per peck for the Michigan samples, 52 ct. for the ones from Maine, and 66 ct. for the Idaho potatoes. The cost per pound of usable potatoes was 3.08 ct. for Michigan, 3.58 for Maine, and 4.55 for those from Idaho."

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Grade analysis of potatoes on the Cleveland market, E. V. Hardenburg (*Amer. Potato Jour., 14 (1937), No. 4, pp. 107–116*).—One hundred and forty-three 15-lb. samples were obtained from 64 Cleveland stores during March and April 1936. Tables show the percentages of the samples by States of origin of different U. S. grades, the average price per pound of different grades, the percentage of samples damaged by different insects and rodents and by different physiological defects, the varietal mixture in samples, and percentages of tubes bruised, by State of origin, variety, and type of store. Nineteen 30-lb. samples were also examined for bruising at the car and at the store.

Florida citrus prices, I, II, A. H. Spurlock and M. A. Brooker (*Florida Sta. Buls. 315 (1937), pp. 84, figs. 29; 317, pp. 31, figs. 6*).—"The purpose of [part 1 of] this study is to present a 3-yr. summary of the average monthly prices received from auction sales for Florida citrus by kinds, by variety, by grade, and by size of fruit; to outline the average costs or charges against the fruit which went to auction; and to arrive at the net amount which the shipping agency received from both auction and nonauction sales." The study is based on shipments during the three seasons from 1930–31 to 1932–33, inclusive, from 31 Florida packing houses to New York, Chicago, Detroit, Cincinnati, and Pittsburgh for auction sales, and to three additional markets—Minneapolis, Kansas City, and New Orleans—for f. o. b. direct and broker sales. Sales of about 11,000 carloads of packed fruit moved by rail or boat are included.

Auction sales made up almost 95 percent of the total auction and f. o. b. sales. Approximately 50 percent of the auction sales were oranges, 40 percent grapefruit, and 10 percent mandarins. Prices of oranges for the same grades and varieties were usually somewhat higher on the New York auction than the average on the other auctions. The three-season weighted average prices per box on the five auction markets were Parson Brown $3.56, Valencia $3.37, Pineapple $3.26, and other varieties $2.95. The price of supergrade oranges averaged 54 ct. per box more than for grade 1, and that for grade 1 exceeded that for grade 2 by an average of 52 ct. per box. In 1930–31 and 1931–32 the auction prices of grapefruit were usually higher on the New York market than in the other markets. In 1932–33 they were usually lower. The three-season weighted average prices for grapefruit on the five auction markets were $2.80 for Marsh Seedless and $2.60 for "other varieties." The average premium for supergrade grapefruit was 40 ct. per box over grade 1. The prices of grade 1 averaged 62 ct. per box more than for grade 2. New York received 70.4 percent of the oranges sold on the five auctions. Its receipts included 95.1 percent of the supergrade and 79 percent of the grade 1 oranges. Of the grapefruit, 59.4 percent went to New York and these receipts included 88.1 percent of the supergrade and 67.9 percent of the grade 1 fruit.

The three-season average grade distribution of all varieties of oranges was supergrade 5.6 percent; grade 1, 56.9; grade 2, 36.6; and grade 3, 0.9 percent. For grapefruit it was supergrade 3.4 percent; grade 1, 54.4; grade 2, 40.9; and grade 3, 1.3 percent. The differences in the price on the five auctions between the most desirable and the least desirable size was 92 ct. per box for oranges, 80 ct. per box for grapefruit, and 34 ct. per half-box for tangerines. The sizes averaging the highest prices were oranges 176, grapefruit 46, and tangerines 90. The total cost per box for freight, refrigeration and precooling, auction selling, and miscellaneous charges declined from $1.14 in 1930–31 to $1.04 in 1931–32 and to 97 ct. in 1932–33. Most of the reduction in costs applied only to the New York market.

The average net returns per box to the shippers for oranges from auction sales were $2.43 in 1930–31, $2.50 in 1931–32, and $1.58 in 1932–33. The net

returns for grapefruit averaged $1.66, $1.62, and $1.41 in the respective years. The net returns per box to growers averaged $1.50, $1.59, and 67 ct. for all varieties of oranges, and 73 ct., 71 ct., and 50 ct. for grapefruit in the respective years.

In part 2 an analysis is made of the average costs of marketing Florida citrus fruit at auctions in the five auction markets during the seasons from 1930–31 to 1932–33, inclusive, according to the method of preservation (precooling and refrigeration by various means and standard ventilation) used and the comparative auction prices received for fruits shipped under the different methods.

Approximately twice as much fruit was sold in New York as in the other four markets combined. All shipments to Chicago, Detroit, Cincinnati, and Pittsburgh were by rail. In 1930–31, 99 percent of the shipments to New York went all-rail, but in 1932–33 57.4 percent went by water routes. The percentages of the total rail shipments to the five markets in the three seasons were precooled, 2.6, initially iced, 13.9, precooled and initially iced, 35.1, precooled and standard refrigeration, 0.4, standard refrigeration, 14.5, and standard ventilation, 33.5. The three-season weighted average cost for freight, selling, and other costs, exclusive of preservation, for shipments by rail, was $1 to New York, $1.07 to Chicago, $1.08 to Detroit, 94 ct. to Cincinnati, and $1.03 to Pittsburgh. Rail and water shipments to New York averaged 75 ct. per box and truck and water shipments 71 ct. The average preservation costs per box for shipments to the five markets were precooling 9.5 ct., initial icing, 10.3 ct., precooling and initial icing combined, 18.1 ct., precooling and refrigeration, 27.3 ct., and standard refrigeration, 19.1 ct. Fruit shipped by standard ventilation bore no direct charges for preservation. "There was no relationship between the method of preservation used in marketing citrus fruit from the 31 Florida packing houses and the auction price received when compared monthly."

Economic studies of vegetable farming in New York.—III, Truck-crop production and prices, E. G. MISNER (*[New York] Cornell Sta. Bul. 679 (1937), pp. 72, fig. 1*).—This is the third bulletin in the series previously noted (E. S. R., 78, p. 125). Tables are included and discussed briefly showing for periods of years the acreages, yields, production, prices, and farm value for 15 truck crops. Monthly and seasonal prices are shown for a number of the crops. During the period 1931–35 the average annual farm value of the leading truck crops in million dollars was cabbage 2.5, onions 2.3, celery 1.8, tomatoes for canning 1.2, and cauliflower 1. Lettuce, peas for canning, snap beans for canning, tomatoes for market, and peas for market each averaged more than one-half million dollars. Carrots, cucumbers for market and pickles, and sweet corn and beets for canning averaged less than one-half million dolars. Potatoes averaged over 14.5 million dollars.

For the 3 yr. 1929–31, 17 commercial truck crops returned 7 percent and potatoes an additional 5 percent of the gross farm income of the farmers of the State. For the periods 1925–29 and 1931–35 the prices for celery, green peas for canning, and onions declined least and the prices for lettuce, potatoes, carrots, cauliflower, and cabbage most, the decline in the prices of the last five crops being 50 percent. The production of cauliflower increased 42 percent, that of onions 31 percent, and that of market tomatoes 111 percent. The total production of 15 truck crops increased 8 percent but the prices declined 38 percent as compared with a decline of 41 percent in the price paid farmers for milk.

Economic aspects of apple production in Rouville County, Quebec, A. GOSSELIN (*Sci. Agr., 16 (1936), No. 12, pp. 676–678*).—This article analyzes

the cost of marketing and prices received for apples, the cash outlay for operating bearing orchards, the price per barrel, and man labor requirements for 30 Rouville County, Quebec, orchards for the years 1932–34.

An economic analysis of the sheep ranching industry in western Canada, L. E. KINDT (*Canada Dept. Agr. Pub. 551 (1936), pp. 76, figs. 22*).—The methods and problems of the organization and management of sheep ranches in Alberta, Saskatchewan, and British Columbia are described, and a detailed study is made of information obtained from 100 ranches for the years 1929–31, inclusive, as to inventories, capitalization, crop and livestock production, receipts, expenses, management problems, etc.

An economic study of the broiler industry in Maryland, P. R. POFFENBERGER and S. H. DEVAULT (*Maryland Sta. Bul. 410 (1937), pp. 54, figs. 14*).—This bulletin reports the results of a study of farms specializing in broiler production and with a total production of over 1,962,000 birds for the 2-yr. period ended June 30, 1936. In 1934–35, 109 farms were studied and 122 farms in 1935–36, the information being obtained by means of a questionnaire and personal interviews. Comparisons are made of all farms and the 25 most profitable and the 25 least profitable farms for the 2 yr. An analysis is made of the data, together with recommendations as to means of increasing the profitableness of producing and marketing broilers.

The broiler production in Maryland in 1936 was approximately 2,500,000 birds, or about 15 percent of the total estimated production in the United States in 1934–35. The size of broiler flocks studied varied from less than 1,000 to over 100,000 birds raised during a year, with an average of 8,494. The broilers were sold at an average age of 13.5 weeks and at an average weight of 2.7 lb. The average investment per farm was $1,295, or 16.4 ct. per bird. The average income was $4,630.21 per farm, or 54.5 ct. per bird. The net profit averaged 5.67 ct. per bird. Total costs per 100 birds averaged $48.84, of which 51.4 percent was for feed, 23.9 for chicks, 8.2 for labor, 5.2 for marketing, 5.3 for overhead, and 6 percent for general expenses. Returns per bird ranged from a net loss of 81 ct. to a net profit of 33 ct. in 1934–35, and from a net loss of 44 ct. to a net profit of 40 ct. in 1935–36. On the most profitable farms, gross income per bird averaged 63.8 ct. and the costs 45.5 ct. per bird as compared with 48.6 and 56.8 ct., respectively, for the least profitable farms. Feed costs and labor costs were highest on the farms having the smallest number of birds. As cost of marketing increased, gross income, cost, and profit increased. As fuel costs increased from 2 to 4 ct. per bird, profit decreased. Income and cost increased as cost of chicks increased, indicating that higher priced chicks may be fed to a heavier weight and thus return a greater income and profit than some of the lower grades of chicks. The most profitable farms had an average investment of 14.7 ct. per bird, the least profitable 21.4 ct. The most profitable size of enterprise was from 5,000 to 15,000 birds. It was more profitable to raise 1 or 2 lots of broilers per year. Income, cost, and profit increased as weight of broilers increased above 2.5 lb. per bird, the most profitable weight being 3 lb. or over. Farmers starting from 150 to 174 birds per 100 sq. ft. of floor space had the greatest profit. Profits decreased as the percentage of mortality increased over 10 percent, and a loss was sustained when it exceeded 25 percent. Sales to local buyers and truckers were the most profitable method of marketing. New York received 69.4 percent of the Maryland broilers, Philadelphia 5.7, Baltimore 13.3, Washington, D. C., 5.2, Newark 3.2, and other markets 3.2 percent. The most profitable farms sold fewer broilers on the New York market and more on the Baltimore and Washington markets than did the least profitable farms. Only about one-third of

the broiler producers operated without the use of credit. The weighted average farm price of broilers was 20.5 ct. per pound in 1934–35 and 21.7 ct. in 1935–36. Cold storage holdings reached the peak in December and January and then gradually declined to the low point in June and July.

List of periodicals containing prices and other statistical and economic information on dairy products, compiled by E. M. COLVIN (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 71 (1937), pp. [1]+114*).—This is a list of 123 periodicals with notes showing the kinds of information contained and the issues available in the Library of the Department.

Seventh census of Canada, 1931.—VIII, Agriculture (*Ottawa: Canada Bur. Statis., 1936, vol. 8, pp. CCXXII+838, [figs. 14]*).—This volume deals with agriculture as of June 1, 1931, giving "the details of farms, farm areas, crops, livestock, animal products, etc. . . . The introduction reviews briefly the changes which have taken place during the decade, 1921–31; in many cases the comparisons are extended back to 1881 and in the Prairie Provinces the results of the quinquennial censuses are also included. The general tables contain a series of comparative tables by provinces and also detailed statistics by counties or census divisions and in some cases by municipalities, townships, or subdivisions. Detailed descriptions of the census divisions used for the presentation of results in Manitoba, Saskatchewan, Alberta, and British Columbia will be found in appendix, together with copies of the schedules used in the taking of the census." The tables and text are in English and French.

Farmers' business organizations in Canada, 1934, W. F. CHOWN (*Sci. Agr., 16 (1936), No. 12, pp. 678–680*).—A table is given and discussed showing by provinces and by commodity groups the number of associations, number of places of business, number of patrons, and the amounts of assets, liabilities, paid-up capital, reserves, etc.

Analysis of the business operations of cooperative cotton gins in Oklahoma, 1933–34, O. T. WEAVER and O. W. HERRMANN (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 12 (1937), pp. IV+96, figs. 21*).—This study was made in cooperation with the Oklahoma Agricultural and Mechanical College to assist associations in improving their operating efficiency and the banks for cooperatives in formulating loan policies to meet the long- and short-term credit needs of such associations. The specific objectives were "to determine (1) the extent of the development of the cooperative gin movement in Oklahoma, particularly the number of associations and members, the volume of cotton ginned, the investment in gin plants, and the equity of the members in these associations; (2) the important factors influencing the expense of ginning cotton by cooperatively owned plants; (3) the sources of income of cooperative cotton gins; (4) the important factors influencing income; (5) the purposes for which the earnings of these associations were distributed; and (6) sound financial policies and practices for guiding new or existing cooperative associations not only in Oklahoma but also in other cotton-ginning areas."

Detailed financial reports, including balance sheets as of the beginning and end of the season and detailed income and expense statements, were obtained covering the 1933–34 cotton season by visits to all (95) cooperative cotton gin associations operating in Oklahoma. Expense statements for 1932–33 were also obtained from all but 5 of the associations. Information on the history, financing, membership, business organization and practices, dividend policies, etc., were obtained from gin managers or officers.

The importance of cooperative ginning—number and size of associations, volume of ginning, assets, liabilities, etc.—is described. The different expenses and sources of income, factors affecting expenses and income, and distribution of earnings are analyzed and discussed.

Some problems in the successful operation of cooperative cotton gins, W. E. PAULSON (*Southwest. Social Sci. Quart., 18 (1937), No. 1, pp. 35–43*).—The problems of ginning rates, computing patronage dividends, financing gins, and the federation of local gin associations are discussed.

Operating status of Nebraska cooperative grain elevators, 1935–36, H. HEDGES (*Farm Credit Admin. [U. S.], Coop. Div., Misc. Rpt. 15 (1937), pp. [2]+34, figs. 6*).—This study was made in cooperation with the extension service and department of rural economics of the University of Nebraska. Financial and operating data were obtained from 130 farmers' elevators for the fiscal year corresponding as nearly as possible with the 1935–36 crop year. An analysis is made of the assets, liabilities, net worth, and operating results. Management problems, the effects of membership and patronage, grain volume and side line business on net income, and the relation of grain volume, size of elevator, and other factors to cost of operation are discussed.

Economic analysis of bargaining problems of milk cooperatives, T. G. STITTS and W. C. WELDEN (*Farm Credit Admin. [U. S.], Coop. Div., Circ. C–104 (1937), pp. III+54, figs. 13*).—"The purpose of this circular is to discuss briefly some of the factors involved in pricing milk in the fluid milk market, to direct attention to the application of statistical data and economic analyses to bargaining problems of the management, and to describe and interpret the experiences of selected associations in the collection, analysis, and use of market records and statistical information. . . . The first [part] is a discussion of some of the factors involved in marketing fluid milk, which deals largely with the economics of market price structure. The statistical analyses included are based partly on data assembled by the regular statistical services of the United States Government, and partly on original data from associations in Washington, D. C., and Baltimore, Md. The second phase consists of a summary of the record-keeping practices of a representative group of associations and a discussion of considerations affecting their collection and use of statistical information."

Milk cooperatives in four Ohio markets, W. C. WELDEN and T. G. STITTS (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 16 (1937), pp. VI+73, figs. 11*).—"The purposes of this study were to analyze, in as much detail as available data permitted, the organization, development, and present status of representative milk associations in Ohio markets in such a way as to allow an appraisal of a number of their operating practices and methods of attack upon problems of fluid milk cooperatives." The field data were obtained during 1935 in cooperation with the Ohio Experiment Station and include information from 7 cooperative milk marketing associations and 652 dairy farmers.

Cooperative organization of Iowa farmers' creameries, F. ROBOTKA and G. C. LAUGHLIN (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 14 (1937), pp. III+92, figs. 10*).—The purpose of this survey, made in cooperation with the Iowa Experiment Station, was "to obtain a cross section view of the general situation regarding farmers' creameries in Iowa." The bulletin deals particularly with corporate and cooperative features of the creameries, methods of operation, character of the relationships between the organizations and their members and patrons, and the effectiveness in carrying out their purposes. The legal basis of Iowa cooperative creameries is described. Control as a privilege and responsibility of membership, financial relationships between the cooperative creamery and its members and patrons, patronage relationship in such creameries, and the participation of patrons in benefits and costs are discussed.

Consumers' cooperative adventures: Case studies, H. J. RANDALL and C. J. DAGGETT (*Whitewater, Wis.: Whitewater Press, 1936, pp. [14]+642+[4], [figs.*

69]).—This textbook consists of case studies of the organization, operation, progress, etc., of consumers' associations organized for different purposes.

State finance of South Dakota.—A preliminary report (*Brookings: S. Dak. State Planning Bd., 1937, pp. [4]+III+65, figs. 22*).—This preliminary report includes data, usually covering the period 1927–36, as to sources and amounts of public revenues, purposes and amounts of expenditures, and the State debt. The receipts, disbursements, etc., of the rural credit department are discussed.

Tax delinquency status of farm land in South Dakota, as of January 1, 1935.—Preliminary report (*Brookings: S. Dak. State Planning Bd., 1937, pp. [2]+III+164+II, figs. 218*).—This preliminary report discusses the tax status of farm land as of January 1, 1935. Maps and charts show for the State and for each county the lands subject to tax deed and those delinquent for 1, 2, and 3 yr., and the percentages that such lands were of the taxable acreage.

Supplementary report on agricultural credit developments relating to commercial banks, N. J. Wall (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+13, figs. 4*).—This report supplements and carries forward the data included in bulletins and reports previously noted on agricultural loans of commercial banks (E. S. R., 76, p. 121), recent agricultural credit developments relating to commercial banks (E. S. R., 77, p. 713), and demand deposits of country banks (E. S. R., 78, p. 122).

Labor input on West Virginia farms, L. F. Herrmann, R. O. Stelzer, and W. W. Armentrout (*West Virginia Sta. Bul. 286 (1937), pp. 12, figs. 15*).—Farmers' estimates of the labor expended on livestock and crops grown in 1934 were obtained in a survey of 716 farms in 38 counties. Tables show by months and by operations the number of hours of man labor and horse work for alfalfa, barley, buckwheat, corn, clover and timothy, oats (grain), oats (hay), potatoes, rye, soybeans (hay), strawberries, tobacco, tomatoes, watermelons, wheat (grain), and wheat (hay). The operations, average acreages, yields, etc., are described, with charts showing the monthly distribution of man labor and horse work.

Accommodation of pickers of hops, fruit, and vegetables (*Jour. Min. Agr. [Gt. Brit.], 44 (1937), No. 3, pp. 267–271*).—The revised model series of bylaws relating to the lodging and accommodation of persons picking hops, fruit, and vegetables, prepared by the Ministry of Health, is given.

Farm tenure in Iowa.—IV, Farm tenure conditions in Palo Alto County, R. Schickele (*Iowa Sta. Bul. 364 (1937), pp. 153–183, figs. 6*).—This bulletin, the fourth in the series previously noted (E. S. R., 77, p. 555), was prepared in cooperation with the Iowa State College Extension Service and the U. S. D. A. Resettlement Administration. It summarizes the findings of the Palo Alto County Agricultural Planning Committee as to farm tenure conditions in the county. The information was obtained from the knowledge and observations of the committeemen, from a survey of 52 individual farms, and from a survey of 344 families in 15 townships sending children to the rural schools.

An analysis of the tenure history of 35 farms for an average period of 37 yr. showed the farms had been occupied by 142 tenants and 45 owners and that the farms had been owned by 89 persons. The average length of occupancy per family was 7 yr. and that for owners was 15 yr., but 24 percent stayed 5 yr. or less. The average term of occupancy for tenants was 4.5 yr., with 49 percent staying 2 yr. or less and 75 percent 5 yr. or less. Only 6 percent stayed 15 yr. or over. Of the 19 tenants at the time of the survey, 11 had occupied the farm 5 yr. or less and 5 from 20 to 25 yr. Of the 16 owner-operators, 4 had lived on the farm from 1 to 4 yr. and 11 from 15 to 26 yr. The average length of ownership of the 89 owners during the last 37 yr. was

14.7 yr. Of the 19 present tenants, 14 held under crop share, 3 under stock share, and 2 under cash rent leases.

The survey of the 344 families showed 27 percent were owner-operators, 69 percent tenants, and 4 percent hired men. Of the owners, 45 percent belonged to organizations and 81 percent to churches. The percentages for tenants were 36 and 74 percent, respectively, and for hired men 13 and 53 percent, respectively. The average years of occupancy since marriage of the head of the family were owners nearly 11 yr., tenants a little more than 6 yr., and hired men about 3 yr. Eighteen percent of the owners and 41 percent of the tenants had lived in the same school district 4 yr. or less.

The origin and nationality of the farm families are discussed. Suggestions as to how landlord-tenant relationships can be improved are included.

Crop insurance in foreign countries: A summary of significant developments (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 71 (1937), pp. [2]+16*).—Significant developments in the field of crop insurance in different European countries, Japan, and China are discussed.

RURAL SOCIOLOGY

Sociology on the spot, C. C. Taylor (*Rural Sociol., 2 (1937), No. 4, pp. 373–381*).—Sociology, or the sociologist, is at this time as never before being given opportunities to offer counsel and to render service in great public, especially governmental, programs. These opportunities automatically place the sociologist and his science where he and his science are being seriously criticized and even censured by other social scientists, especially the economists. The sociologist refuses to answer dogmatically some of the specific inquiries put to him, he fumbles considerably in his answers when he is willing to give them, he is finding it difficult to reduce his knowledge to sufficiently lucid terms to convey to administrators and officials; and he finds it even more difficult to apply his knowledge to the specific situations with which he is confronted.

Social planning and the sociology of subregions, C. E. Lively (*Rural Sociol., 2 (1937), No. 3, pp. 287–298*).—"There is considerable confusion regarding the nature of social planning in a democracy. Our traditional individualism causes many people to abhor social planning as a form of regimentation. There are many forms of regimentation already in existence, however, and much of it is the natural product of a system in which the socially weak and the socially strong are permitted to compete, individually and in groups, for an indefinite time. Furthermore, the attainment of certain desirable social ends can never be attained by competitive methods. The control of communicable disease, social security, and many other such goals can be attained only by general social cooperation and unity of action."

[**Miscellaneous contributions in rural sociology**] (*Rural Sociol., 2 (1937), Nos. 3, pp. 266–277, 299–309; 4, pp. 415–428, 444–456*).—The contributions here presented are Recent Changes in German Rural Life, by J. B. Holt (pp. 266–277); The Story of My Drift Into Rural Sociology—II, Beginnings of Rural Sociology at the University of Wisconsin (pp. 299–309), and III, Fifteen Years in the U. S. Department of Agriculture (pp. 415–428), by C. J. Galpin (E. S. R., 78, p. 558); and A Statistical Study of the Croatans, by R. M. Harper (pp. 444–456).

A graphic summary of farm labor and population (based largely on the census of 1930 and 1935), J. C. Folsom and O. E. Baker (*U. S. Dept. Agr., Misc. Pub. 265 (1937), pp. II+48, figs. 69*).—"Out of every 100 farm workers on April 1, 1930, approximately 58 were farm operators, 26 were wage workers, and 16 were unpaid family workers. The total was 10,482,000. The 1935 Census of

Agriculture, taken as of January 1, reported the numbers of persons who had done two or more days of farm work during the first week of January. Farm operators made up 53 of every 100 farm workers, other family members 34, and hired help 13. The total was 12,408,000. Most persons thus occupied in midwinter may be considered all-year workers in the industry. . . .

"During the decade 1920–29 about 40 percent of the youth who started to work in the factories, offices, and stores of the cities came from the farms—for probably two decades, on the average, they had been fed, clothed, and educated by the farming people, and were then provided practically free of cost to the cities, ready for life's work."

The disadvantaged farm family in Alabama, H. Hoffsommer (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 178, 179*).—Although tenancy is possibly the most important single farm problem of the present time, it is believed that great danger lies in centering attention on it to the exclusion of other important factors. Of the 273,773 rural farm families in Alabama (1930), 30,028 fall into this disadvantaged group. Approximately 85 percent of these resided in the open country, 11 percent in the villages, and 4 percent in towns and cities. The characteristics of the disadvantaged farm family are such that it will need a period of years for adequate adjustment. The general approach to the problem must be educational. It should not be limited to training for home ownership or for any other particular tenure status, since the data show that these families may be disadvantaged as owners or as tenants or laborers as well; but the education should be directed at the enrichment of life in all its phases and under all its circumstances.

The relief situation in Colorado rural and town areas, O. F. Larson and J. E. Wilson (*Colorado Sta. Res. Bul. 5 (1937), pp. [1]+V+31, figs. 14*).—This report is based largely on data collected in the study of public and private assistance in rural and town areas made by the division of social research of the Works Progress Administration to obtain information concerning the intensity, cost, and trend of assistance in representative areas.

Social organizations and agencies in North Dakota: A study of trends, 1926–1936, D. G. Hay (*North Dakota Sta. Bul. 288 (1937), pp. 90, figs. 53*).—In this second report (E. S. R., 60, p. 88) of a study of social organizations and agencies in the State, prepared in cooperation with the Federal Emergency Relief Administration and the Works Progress Administration, the author deals with the changes in number and distribution of such agencies during the period 1926–36, the data being presented in tables and maps.

"The number of social agencies in North Dakota has in general been maintained during the period, 1926–36, although certain of the agencies experienced losses while others had increases in the number of local units.

"The distribution of many of the agencies was highly favorable to the few large village and city areas in the State. The farm families were definitely underprivileged compared to the nonfarming population in respect to accessibility to nearly all of the social agencies considered in this study, and the distribution of agencies in relation to farm residents was more unfavorable in 1936 than in 1926. The location of many of the agencies by individual counties was more highly related to the presence of villages and cities than to the total population of the counties.

"There was a definite trend toward the location of agencies in the larger population centers. The number of open country agencies decreased in practically all cases as compared to those in villages and within the size classes of villages there was a high association of increase in number of agencies with the larger the population of the village. This trend was especially noticeable

in the social and recreational organizations for adults, including commercial and service clubs, war veteran organizations, and lodges. Significant results of this trend will include the developing of a larger community attitude on the part of the participants in these special interest organizations and will decrease the social influence of the immediate locality or neighborhood."

Hospitals for rural communities, B. Halbert (*U. S. Dept. Agr., Farmers' Bul. 1792 (1937), pp. II+42, figs. 16*).—This supersedes Farmers' Bulletin 1485 (E. S. R., 55, p. 85). It gives information on hospital needs, size, cost, financing, and plans, based on the experiences of many localities.

The activities of rural young people in Missouri: A survey of 2,297 young people attending high school, E. L. Morgan and M. W. Sneed (*Missouri Sta. Res. Bul. 269 (1937), pp. 68, figs. 6*).—"This investigation relates to some of the economic and social activities of rural young people. The scope of the inquiry was extended to 12 sample counties and included 2,297 young people, aged 16–24, who were living on farms and in places having up to 5,000 population. Those studied were in high school at the time of the survey.

"It was found that about one-half of the boys in villages and towns were finding some work for pay, while one-fourth of those on farms were likewise employed. A total of 55 different occupations were indicated as being those at which the informants had worked outside the home. Employment at school, which was made possible largely by the National Youth Administration, figured prominently among the occupations given.

"It appeared that many local organizations were failing to provide the programs or activities in which many of the young men and women would be interested. In addition to a variety of activities in which young people were engaged, they also reported things they would like to learn to do and indicated others in which they could participate if facilities were provided by their local communities.

"Along with their future plans, a number of different occupations were listed as the occupational preferences of young people. Also given were suggestions regarding the principal needs of young folk in the community. From these proposals it appeared that young people are generally aware of many local problems. It is suggested that the thinking of young people be incorporated into local planning by responsible community leaders."

The arts workshop of rural America, M. Patten (*New York: Columbia Univ. Press, 1937, pp. [7]+202*).—A study of the rural arts program of the agricultural extension service is presented.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Problems in agricultural marketing, D. W. Malott (*New York and London: McGraw-Hill Book Co., 1938, 1. ed., pp. XIII+410, [figs. 12]*).—"The group of cases comprising this volume is intended to present concrete material for analyzing the problems faced by those engaged in the various phases of agricultural marketing and is typical of those situations which constantly appear for decision in the conduct of the various agricultural industries. . . . Questions at the end of each case present a possible focus of analysis and discussion looking toward the formulation of sound marketing principles. Questions at the end of each section are designed to stimulate comparisons as well as to furnish general review of the material covered."

The material is arranged under the following section headings: Marketing by the agricultural producer at country points, the auction markets, organization and operation of the futures exchanges, uses of the futures exchanges, the central markets, problems of the middleman, cooperative marketing, cooperative

advertising projects, storage and transportation, financing the movement of commodities, purchasing policies of the processors, and national problems of agricultural policy. Each section is followed by a list of suggested readings. A list of selected references is also included.

Agricultural bookkeeping, P. E. McNall and K. F. McMurry (*New York and London: Longmans, Green and Co., 1937, pp. VIII+205*).—This is a textbook planned to meet "the need of adult readers and students who want perspective rather than the elaboration of a large treatise."

FOODS—HUMAN NUTRITION

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1937, pp. 2–5*).—Included in this annual report (E. S. R., 76, p. 715) are summaries of studies dealing with the vanadium content of foods and its relation to nutrition; the vitamin content of citrus hybrids and canned tomatoes, soybeans, and rice; the foaming of eggs; depth of planting, potash ratios, and table quality in potatoes; soybean flour; time of processing and quality of beef; the shrinkage of beef roasts cooked by two different methods; the method of selecting a panel of judges for bread studies; and a comparison of the cost and quality of some home-made v. commercially prepared food mixtures.

Food and Drugs Act, W. G. Campbell (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1937, pp. 1–20*).—This annual report on the enforcement of the Federal Food and Drugs Act (E. S. R., 76, p. 561) contains summaries of the food adulterations investigated involving public health, filth and decomposition, and economic cheats; of the seizures of canned fruits and vegetables under the McNary-Mapes amendment; of the inspection of shrimp canneries under the sea-food amendment; and of the inspection and seizures of chemicals and medicinal preparations purported to be of National Formulary quality or to comply with the requirements of the United States Pharmacopoeia, and of anesthetic ether and veterinary preparations. Progress reports are also given of the work of the bacteriological section, the Vitamin Division, and the Division of Pharmacology, of the development of new analytical methods for foods, and comments on court cases.

[Food studies at the Colorado Station] (*Colorado Sta. Rpt. 1937, pp. 32, 33*).—This progress report (E. S. R., 76, p. 561) summarizes the results of a series of baking tests on cakes made from calculated recipes in continuation of the study of baking of flour mixtures at high altitudes, and of the softening of potato tubers during cooking.

[Food and nutrition studies by the Georgia Station] (*Georgia Sta. Rpt. 1937, pp. 51, 52*).—This progress report includes brief summaries of studies on the degree of dark adaptation of school children as shown by biophotometer tests; the availability of iron and calcium in vegetable greens and other foods; the effect upon the vitamin A content of the milk of feeding dried pimiento to cows depleted of their vitamin A reserves; and the vitamin A, B, and G content of peaches.

The structure and composition of foods.—III, Milk (including human), butter, cheese, ice cream, eggs, meat, meat extracts, gelatin, animal fats, poultry, fish, shellfish, A. L. and K. B. Winton (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, vol. 3, pp. XXV+524, figs. 11*).—In this volume, which continues the series noted previously (E. S. R., 73, p. 869), the general plan of the foregoing volumes has been followed in discussing the chemical composition and the constituents of foods of animal origin, and special

attention is given to the influence of the various factors of production and manufacture on the composition.

The relationship of the albumen index of eggs to their appearance when fried or poached, M. Shelly, M. Boggs, L. A. Wilhelm, and V. Heiman (*U. S. Egg and Poultry Mag., 43 (1937), No. 8, pp. 478, 479, 515, fig. 1*).—In this contribution from the Washington Experiment Station new-laid White Leghorn pullet eggs weighing from 52 to 60 g and having an albumin index falling within the ranges of 50 to 75, 95 to 110, or 120 to 145 were fried or poached, and the albumin index was again measured by dividing the height of the apparent thick white by the mean diameter.

The results suggest the existence of a close relationship between the albumin index of fresh and fried or poached eggs, with a coefficient of correlation between raw and fried eggs of 0.842±0.025 and between raw and poached eggs of 0.906±0.015. It was noted that the eggs with a low albumin index failed to veil the yolk satisfactorily, and generally the yolk was off-center, the white was irregular in outline and covered a large area. Since the eggs tested were less than 36 hr. old, "it is apparent that certain birds produce eggs which have undesirable characteristics for frying and poaching despite the fact that their nutritional value may be the same."

The use of lard in cake baking, D. G. Berrigan (*Cereal Chem., 14 (1937), No. 4, pp. 525–531, fig. 1*).—In this contribution from the North Dakota Experiment Station the results of a series of tests are reported in which cakes made with two types of hydrogenated vegetable shortening and a hydrogenated lard were compared. The A. A. C. C. formula and method of procedure were modified until a lard product was obtained which was comparable in viscosity of batter and volume of cake to that obtained with a hydrogenated product. To obtain good cakes with lard as the shortening, the author recommends that the amount of fat used be increased, the amounts of liquid and sugar be decreased, and part of the egg albumin and sugar be added in the form of a meringue during the last one-half min. of the mixing process. To get a crust of the proper color and texture the oven temperature should be reduced.

A review of the bacteriology of fresh marine-fishery products, F. P. Griffiths (*Food Res., 2 (1937), No. 2, pp. 121–134*).—A contribution from the Oregon Experiment Station, presented with a three-page list of references to the literature.

Effect of mixing on the physical properties of dough, L. J. Bohn and C. H. Bailey (*Cereal Chem., 13 (1936), No. 5, pp. 560–575, figs. 4*).—In this contribution from the Minnesota Experiment Station, the authors report a series of baking tests on strong and medium strength flour doughs mixed for varying lengths of time in commercial mixers. In the slow-speed mixer the best baking results were obtained by 15-min. mixing of strong flour dough and 10-min. mixing of medium strength dough. In the high-speed mixer 3-min. mixing of strong flour dough and 2-min. mixing of medium strength flour dough gave the optimum baking results according to the standard A. A. C. C. baking test.

The dough formula used had a marked effect on the time required to reach the optimum development of the dough. The stress readings tended to fall off after the point of optimum dough development was reached, which demonstrated that overmixing produced marked physical changes in the plastic properties of the dough, and were also decreased when the temperature of the mix was elevated from 20° to 35° C. and when the percentage of water in the dough was increased. When the dough was allowed to rest for 15 min. after mixing, the stress readings were higher.

Potato consumption and dietetic value, E. V. HARDENBURG (*Amer. Potato Jour., 14 (1937), No. 6, pp. 185–188*).—This brief review of recent literature on the subject is a partial report of the research committee of the Potato Association of America.

The determination of the cooking quality of potatoes, E. R. BEWELL (*Amer. Potato Jour., 14 (1937), No. 8, pp. 235–242, figs. 2*).—In this general discussion the dry matter content of the potato is considered the best index of quality, a high content (30 percent) being associated with good quality and a low content (15 percent) with poor quality. As dry matter is correlated with specific gravity, the quality can be rapidly estimated by determination of the specific gravity and noting the dry matter content corresponding to this specific gravity in tables prepared from many tests. Cooking tests are recommended for the consumer who buys direct from the producer but are considered impractical when potatoes are bought in small quantities.

Acid and sugar important factors in flavor of tomatoes, F. A. LEE (*Farm Res. [New York State Sta.], 4 (1938), No. 2, pp. 4, 9*).—The information presented in this paper on the ways of improving the flavor of tomato products has been previously noted from another source (E. S. R., 78, p. 156).

A laboratory handbook for dietetics, M. S. ROSE (*New York: Macmillan Co., 1937, 4. ed., pp. XI+322, figs. 3*).—The general plan of this new edition is similar to that of the preceding one previously noted (E. S. R., 62, p. 90). The most important changes noted are the addition of new values for the mineral and vitamin content of foodstuffs and of a table showing the excess of acid or base in 100-calorie portions of some 150 foods.

Outstanding problems in human nutrition, S. J. COWELL (*Jour. State Med., 45 (1937), No. 8, pp. 440–448*).—The author reviews the recent developments in the field of human nutrition and discusses particularly the adequacy of the food supply of Great Britain in the vitamins and mineral elements, the relationship of nutrition to infection and to dental decay, and the nutrition of women during pregnancy and lactation.

What's new in nutrition, M. L. HATHAWAY (*Jour. Home Econ., 29 (1937), No. 5, pp. 301–306*).—The progress made during the past year is summarized under the nutritive value of foods, the causes of differences in the amount of vitamins and minerals available in common foods, the methods of following foods and their ultimate storage or utilization in the animal body, and the mineral requirements of children and adults.

Nutrition problems in education, J. S. MCLESTER (*Jour. Amer. Med. Assoc., 109 (1937), No. 11, pp. 838, 839*).—In this discussion of a nutritional program in the public schools, the opinion is expressed that the greatest energy should be expended not on individual selected children in a manifestly poor state of nutrition but rather on the student body as a whole, with the ultimate goal of the optimum for all children.

Advisory Committee on Nutrition.—First report, LORD LUKE ET AL. (*[Gt. Brit.] Min. Health, Advisory Com. Nutr. Rpt., 1 (1937), pp. 52*).—This first report of the Advisory Committee on Nutrition, appointed in 1935 by the Ministry of Health "to inquire into the facts, quantitative and qualitative, in relation to the diet of the people, and to report as to any changes therein which appear desirable in the light of modern advances in the knowledge of nutrition," consists of a preliminary survey of the whole field. Introductory chapters on the present knowledge of nutrition and a general picture of the food supply of the United Kingdom are followed by chapters on food statistics, physiological bases of nutrition (based largely on the report of the Health Committee of the League of Nations), the nutritive value of milk and milk products, the

assessment of the state of nutrition, dietary in poor law institutions, and proposal for further investigations. More detailed information, including tabulated data, is presented in a series of appendixes. Problems recommended for further study include assessment of the nutritional state of children, nutritive food requirements during the first year of life, minimum vitamin, mineral, and fat requirements, nutritive supplementary values of the protein-containing foods, relative nutritive value of different cereals according to the degree of milling, influence of climate on food requirements, and optimum amounts of milk required at different ages.

The scientific work of the Health Organization of the League of Nations, T. Madsen (*Bul. N. Y. Acad. Med., 2. ser., 13 (1937), No. 8, pp. 439–465*).—In this Harvey lecture, delivered by the director of the Health Organization of the League of Nations, the various activities of the organization are described with illustrations from some of the more important work of its commissions, including the scope of the present activities in nutrition.

The bearing of the results of recent studies in nutrition on health and on length of life, H. C. Sherman (*Bul. N. Y. Acad. Med., 2. ser., 13 (1937), No. 6, pp. 311–323*).—In this Hermann Biggs memorial lecture, delivered before the New York Academy of Medicine, April 1, 1937, the author discusses the public health and economic significance of the newer knowledge of nutrition, particularly the results of his long-time experiments on the effects of improvements in an already adequate diet.

"To fit nutrition into the concept of public health as a purchasable commodity requires an amplification of the educational function of the physician and the health department, and a further development of nutrition teaching in the schools. . . . Simple redistribution of the present expenditures for food, and this without omitting any article of food to which any consumer is accustomed but merely by easy shifting of relative proportions, can undoubtedly contribute greatly to the advancement of the standard or norm of health and vitality in the coming years. . . . For it is now clear to anyone who will study the evidence that nutrition has greater constructive potentiality than science had foreseen, and that even in the everyday choice of food we are dealing with values which are above price, for the health and efficiency, duration and dignity, of human life."

The relation of the size of the meal to the emptying time of the human stomach, E. J. Van Liere, C. K. Sleeth, and D. Northup (*Amer. Jour. Physiol., 119 (1937), No. 3, pp. 480–482*).—In continuation of the study noted previously (E. S. R., 75, p. 568), the authors determined fluoroscopically the normal gastric emptying time in six healthy young male subjects. When the standard test meal, consisting of farina 15 g, sodium chloride 1, and barium sulfate 50 g, was doubled the emptying time was prolonged 16.83 percent, and when the meal was tripled, 38.33 percent in five subjects. In the remaining subject the size of the meal apparently had no effect on the gastric emptying time. "This paper lends experimental evidence to the well recognized fact that the onset of hunger contractions in the majority of people does not appear as soon after a large meal as after a small one."

A study of the effect of overfeeding on the protein metabolism of man, I–III (*Biochem. Jour., 31 (1937), No. 4, pp. 681–693, figs. 3; pp. 694–705, figs. 3*).—Three papers are presented.

I. *The effect of superimposing raw and boiled milks on a diet adequate for maintenance,* D. P. Cuthbertson, A. McCutcheon, and H. N. Munro (pp. 681–689).—The subjects were seven healthy men ranging in age from 19 to 35 yr. on self-selected constant basal diets composed of white and brown bread, 100

g of butter, cheese, 500 cc of raw milk, apple jelly, raw apples, and a constant water intake. Three subjects received in addition lettuce and tomatoes. After nitrogen equilibrium had been established, an additional liter of raw or boiled milk was given and the water intake was reduced. Upon reestablishment of nitrogen equilibrium the additional milk was again administered and the test repeated from 2 to 4 times with each subject. The urinary excretion of nitrogen and sulfur was determined daily. In one subject the calcium balance was investigated.

The subjects showed an increase in body weight and a marked retention of nitrogen and sulfur but not of calcium upon the addition of the raw or boiled milk for either 1 or 8 days. In a subject who was given sodium caseinate equivalent in nitrogen content to a liter of milk, the storage of nitrogen was decreased.

II. *The superimposition, on a diet adequate for maintenance, of beef (or soya flour)+lactose+butter, equivalent in protein, carbohydrate, and fat content to a litre of milk*, D. P. Cuthbertson, A. McCutcheon, and H. N. Munro (pp. 689–693).—In this part of the study the basal diet was supplemented by lean beaf, lactose, and additional butter in amounts equivalent to the quantities of protein, fat, and carbohydrate in a liter of milk, and the water intake was correspondingly increased. The resulting marked retention of nitrogen showed that the retention phenomenon was not a peculiar property of the additional milk. Similar results were obtained when soybean flour was substituted for the lean beef in the supplement. It is concluded that when a dietary adequate for maintenance is supplemented by animal or vegetable protein the degree of retention of nitrogen and sulfur which results appears to bear a relationship to the total increment in the energy value of the diet and not to the increment in the protein per se.

III. *The protein-saving effect of carbohydrate and fat when superimposed on a diet adequate for maintenance*, D. P. Cuthbertson and H. N. Munro (pp. 694–705).—The authors served as subjects to determine the role played by the general rise in energy value of the diet above the energy requirement. The cheese was eliminated from the basal diet, and the supplement consisting of beef, lactose, and butter was added. When the energy intake exceeded the requirement necessary to maintain body weight and nitrogen equilibrium, the body weight and the nitrogen and sulfur retention increased. Under the conditions of the experiment the carbohydrate, glucose, had greater nitrogen- and sulfur-sparing effects than did the fat, butter.

The food intake of young rats held at nearly constant body weight by restriction of the dietary protein, C. M. Jackson (*Jour. Nutr., 13 (1937), No. 6, pp. 669–678, fig. 1*).—Thirty-five male and 32 female rats were maintained for 15 weeks on a diet containing all the known essentials except protein and supplemented by a yeast-wheat germ mixture to supply just sufficient protein to keep the weight at approximately 50 g. During the first week on experiment the average intake of protein per rat was about 3 g, which decreased to about 2.7 g in the sixth week. Thereafter the requirement of yeast-wheat germ mixture remained nearly constant at a daily level slightly below 0.4 g per rat.

The amount of basal diet voluntarily consumed was found to be closely parallel to the restricted protein intake, with the average weight of protein remaining nearly constant at about 11 percent of the total diet. Calculated on a selective basis, the energy value of the total diet consumed averaged 0.346 calorie daily per gram of body weight for the male and 0.374 calorie per gram for the female rats. A slight but probably significant sex difference was

indicated, with the male rats requiring relatively less protein for maintenance and showing a relatively smaller intake of the basal and total diets.

The relation of protein to hemoglobin building, P. B. PEARSON, C. A. ELVEHJEM, and E. B. HART (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 749–763, fig. 1*).—In this contribution from the Wisconsin Experiment Station, the authors studied the effect of nine different proteins on the rate of hemoglobin regeneration in induced nutritional anemia in rats when the intake of iron and copper was sufficiently adequate to permit optimal response.

From the results reported it is evident that proteins that permit good growth will allow optimum hemoglobin formation. It would appear that when the dietary protein is either qualitatively or quantitatively inadequate for growth the rate of hemoglobin regeneration is significantly retarded. The proteins of liver, casein, egg albumin, and soybean oil meal were consistently effective in building hemoglobin, whereas corn gluten meal, wheat gluten, gliadin, gelatin, and blood were poorly utilized.

Mineral requirements in human nutrition, E. M. WIDDOWSON (*Jour. State Med., 45 (1937), No. 8, pp. 449–461*).—In this review paper, the author discusses briefly the qualitative mineral requirements and intakes and the availability of iron, calcium, and phosphorus in the diet.

Carbohydrate metabolism during experimental human salt deficiency, R. A. McCANCE (*Biochem. Jour., 31 (1937), No. 8, pp. 1276, 1277*).—Glucose tolerance tests were made on five adult men made salt-deficient by diet and sweating, as described in a previous study (E. S. R., 76, p. 563). When the results were compared with those of similar tests made when the subjects were in a normal state, it was found that during salt deficiency the concentration of the blood sugar was elevated slightly.

The changes in the plasma and cells during experimental human salt deficiency, R. A. McCANCE (*Biochem. Jour., 31 (1937), No. 8, pp. 1278–1284*).—In continuation of the investigation noted above, further tests on the five subjects demonstrated that during salt deficiency the concentration of sodium chloride in the serum decreased, with a resulting increase in the serum proteins, hemoglobin, and cell volume of the blood and a passage of the potassium, chloride, and possibly sodium ions out of the cells. When salt was administered the serum proteins, hemoglobin, and cell volume fell below their initial levels.

A stable ferrous sulphate mixture for the treatment of nutritional anaemia in young children, H. M. M. MACKAY and L. E. JACOB (*Lancet [London], 1937, II, No. 10, pp. 570–573*).—The treatment of 26 babies with iron deficiency anemia with doses of 9 or 4½ grains of ferrous sulfate daily produced an average daily rise in hemoglobin level of almost 1 percent during the first 3–5 weeks of treatment. It is concluded that a dose of 4½ grains daily containing about 60 mg of iron is probably as effective as double that quantity. The ferrous sulfate can be effectively administered in solution with dextrose and a very small quantity of hypophosphorous acid, which increases the stability of the solution. Although the ferrous salt has great advantage as a therapeutic, the cheap and stable iron and ammonium citrate is advocated for routine use as a prophylactic.

Further field studies on the selenium problem in relation to public health, M. I. SMITH and B. B. WESTFALL (*Pub. Health Rpts. [U. S.], 52 (1937), No. 40, pp. 1375–1384*).—In continuation of the survey noted previously (E. S. R., 77, p. 277), the authors report the results of a field study made during September 1936 of 50 rural families in a highly seleniferous area in four counties of South Dakota and Nebraska. Specimens of urine obtained from two or more members of each family and samples of common foodstuffs and drinking water were analyzed.

The selenium concentration in the urine was found to vary from 20 to 198 μg per 100 cc, with very little variation for the different members of the same family or for the same individual at different times. The only evidence of ill health that might possibly be the result of continual selenium ingestion was a high incidence of symptoms of gastric or intestinal dysfunction and a few instances of apparent hepatic dysfunction.

The most important and most constant food sources of selenium in the area studied were found to be meat, 117–800 μg, and eggs, 25–914 μg per 100 g; milk, 16–127 μg per 100 cc; and vegetables such as peas and beans, cabbage, rutabaga, and onion with a maximum content of 204, 452, 600, and 1,780 μg per 100 g, respectively.

Studies on zinc, W. R. Sutton and V. E. Nelson (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 211–213*).—The limit of tolerance to zinc carbonate was determined on groups of rats maintained on an adequate ration containing the salt at three levels corresponding to 0.1, 0.5, and 1 percent of zinc. Hemoglobin values were determined by the Newcomer method, and red blood cell counts were made.

The results show that the limit of tolerance lies between 0.5 and 1 percent of zinc. Growth and reproduction were normal at the lowest level of zinc, reproduction was markedly affected at the 0.5-percent level, and both growth and reproduction failed to occur in the animals receiving 1 percent of zinc after 39 weeks on the diet. The hemoglobin values and red blood cell counts remained within the normal range at the lowest level of zinc feeding, the hemoglobin values decreased at the 0.5-percent level, and at the highest level both were diminished. Upon removal of the zinc salt from the diet, the hemoglobin values became normal in the rats on the 0.5- and 1-percent levels, with a return to normal reproduction also resulting in the rats formerly receiving 0.5 percent of zinc.

Biology [trans. title] (*5. Cong. Internatl. Tech. et Chim. Indus. Agr., Schéveningue, 1937, Compt. Rend., vol. 1, pp. 7–78, 89–131, figs. 26*).—The following studies on nutrition are discussed in section 1: Vitamin K and the Means of Verifying Its Presence and the Quantity Contained in Agricultural Products, by H. Dam (pp. 7–12); The Quantitative Determination of Vitamin B_1 in Rats and the Stability of the International Standard Preparations for Vitamin B_1, by A. Scheunert and M. Schieblich (pp. 13–19); The Determination of the Provitamin A by Chromatography, by L. Zechmeister (pp. 20, 21); A Plant Test for Aneurin, by W. H. Schopfer and A. Jung (pp. 22–34); Methods of Estimation of Vitamin B_1, by R. A. Peters (p. 35); The Dosage of Vitamin A, by A. Chevallier (pp. 36–38); The Accuracy of Biological Determinations of the Vitamins, by K. H. Coward (pp. 39–47); The Content of the Vitamin B_1 and B_2 in Different Kinds of Wheat and Rye Breads, by L. S. Fridericia and M. Schousboe (pp. 48–56); The Quantitative Chemical Determination of Flavin in Urine, Liver, and Milk, by A. Emmerie (p. 57); Spectroscopic Determination of Vitamin A, by R. A. Morton (pp. 58–67); The Quantitative Estimation of Vitamin D With Chickens as Test-Animals, and the Relation of Rat- to Chicken-Activity for Different Irradiated Provitamins, by J. van Niekerk, A. G. Boer, E. H. Reerink, and A. van Wijk (pp. 68, 69); The Utilization of Vitamin Tests, by A. Jung (p. 70); The Difficulties Encountered in the Control of Special Vitamin Foods, by M. Bauwen (pp. 71–78); Vitamin Standardization, by H. Chick (pp. 89–91); Some Recent Advances in Vitamin Science, by A. L. Bacharach (pp. 92–99); The Estimation of Vitamin B_1 by the "Bradycardia" Method (pp. 100–111) and The Estimation of Vitamin C by Chemical Titration (pp. 112–118), both by L. J. Harris; The Changes in the Content of Vitamins B_1 and C During Germination of Wheat, by

A. von Kuthy (pp. 119–126); and The Content of Vitamin C in Different Varieties of Potatoes, by J. B. H. Ijdo (pp. 127–131).

Beef, hog, calf, and lamb livers as sources of vitamin A, A. D. Holmes, F. Tripp, and G. H. Satterfield (*Food Res., 1 (1936), No. 5, pp. 443–455*).—The vitamin A content of fresh beef, hog, calf, and lamb livers was determined by the colorimetric method. From the data reported it is evident that calf liver is superior to the other livers as a source of vitamin A, containing an average of 533 Lovibond blue units per gram as compared to beef 252, lamb 235, and hog 182 units per gram of liver.

The vitamin A content of Australasian fish liver oils, I. W. Davies and D. J. Field (*Biochem. Jour., 31 (1937), No. 2, pp. 248–250*).—Using the Carr-Price method with the Lovibond tintometer to estimate the intensity of the blue color and measuring the intensity of adsorption at 328 mμ of a solution in cyclohexane with the Hilger Vitameter, vitamin A values were determined for eight fish liver oils.

Expressed as percentages of vitamin A, using the results previously reported by Carr and Jewell (E. S. R., 69, p. 325), the Carr-Price values varied from 0.031 to 2.3 percent and the vitameter values from 0.034 to 2.4 percent, showing a fair agreement between the two methods of measuring. The liver oil of the school or snapper shark, containing approximately 1 percent of vitamin A, is less rich than that of most halibuts, but is of some economic importance because the shark liver contains about twice as much oil as does the liver of the halibut.

Influence of hyperthyroidism on vitamin A reserves of the albino rat, B. Sure and K. S. Buchanan (*Jour. Nutr., 13 (1937), No. 5, pp. 521–524*).—Data are presented to show that even massive doses of vitamin A are ineffective as an antithyrogenic agent and cannot replace the essential stable components of the vitamin B complex furnished by autoclaved dried baker's yeast and which are deficient in autoclaved beef. Rapid catabolism, produced by the daily administration of 0.2 mg of thyroxin, was not counteracted by the administration of a ration containing 10 percent butterfat and supplemented with 4 drops of cod-liver oil daily. The administration of a diet containing 50 percent dried skimmed milk powder produced excellent responses to pure crystalline vitamin B as an antithyrogenic agent in experimental hyperthyroidism.

Antithyrogenic action of crystalline vitamin B, B. Sure and K. S. Buchanan (*Jour. Nutr., 13 (1937), No. 5, pp. 513–519*).—In continuation of previous studies (E. S. R., 72, p. 885) the authors present the results of a series of experiments to show that the toxicity of 0.2 mg of thyroxin administered to a rat may be counteracted by from 30γ to 100γ daily of pure crystalline vitamin B_1, which is an excellent antithyrogenic agent. The best results were obtained when autoclaved dehydrated baker's yeast rather than autoclaved dried beef was used as a source of the stable components of the vitamin B complex in the experimental diet.

The vitamin B complex: A clinical and experimental study with special reference to growth and constipation, C. L. Joslin and S. T. Helms (*Arch. Ped., 54 (1937), No. 9, pp. 533–547, figs. 14*).—A series of clinical experiments was made during a 1-yr. period on 100 infants to determine the results of adding a vitamin B-complex supplement to the diet during the first year of life. The basic diet consisted of milk, water, and carbohydrate, with the addition of cereal and vegetables after 6 mo. of age. The experimental group of 100 infants received a supplementary mixture of Dextri-Maltose with vitamin B, and the control group received the carbohydrate alone.

The administration of the additional vitamin B-complex resulted in a definite increase in growth of the infants in length, development of the chest, and weight

and had a definite effect in the correction of constipation. The administration of the vitamin B-carbohydrate mixture to the nursing mothers of 50 infants who had failed to gain weight for from 3 to 4 weeks due to insufficient breast milk increased lactation in 57 percent of the cases and resulted in a decrease in the incidence of constipation among the infants.

Similar experiments carried out on 20 infants and 100 older children with the additional vitamin B complex supplied in a prepared cereal mixture showed the same increased growth and decrease in constipation, with an improvement in appetite noted among the older children.

Following the clinical tests, a study was conducted on a group of rats maintained on the Evans-Lepkovsky vitamin B-free diet. When signs of B avitaminosis appeared, varying amounts of the special cereal rich in vitamin B were administered. The resultant increase in growth was influenced by the amounts of the vitamin B intake, with no appreciable increase when the cereal was given in amounts larger than 2 g per rat per day.

Vitamin B_1 deficiency in infancy: A critical review, M. R. Price (*Arch. Disease Childhood*, *12* (*1937*), *No. 70, pp. 213–216*).—In this review article the author points out that the normal infant requires about 200 international units of vitamin B_1 per day.

Water ingestion and urinary excretion of ether-soluble materials in B and G avitaminotic rats, R. Reder and W. D. Gallup (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *16* (*1936*), *pp. 66, 67*).—In this contribution from the Oklahoma Experiment Station the results of a series of paired feeding experiments, following the method previously described (E. S. R., 73, p. 883), are reported. During a 14-day preliminary period the rats received a diet in which the vitamin B content was gradually decreased and finally removed from the diet of one group and vitamin B supplement was given to the pair mates in a control group. The pair mates were limited to the same food intake. The water intake was determined daily and averaged for the experimental rats 8.2 cc and for the controls 9.7 cc, which suggests a definite decrease in water consumption during vitamin B deprivation.

In another series of tests 16 adult rats were arranged in four groups so that each series consisted of rats of the same sex and approximately the same weight. The first animal of each series received the basal vitamins B- and G-free diet unsupplemented, while the second, third, and fourth animals received vitamin B, vitamin G, and vitamins B and G, respectively. The daily food intake of each pair of animals was the same. The results show that the animals deprived of vitamin G or of vitamins B and G excreted the smallest amounts of urinary solids. Very little difference was noted in the amounts of ether-soluble material excreted.

Observations on the behavior of B and G avitaminotic rats and the specific growth effect of vitamin B, R. Reder (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *16* (*1936*), *pp. 64–66*).—At the Oklahoma Experiment Station rats deprived of the vitamin B complex continued to show slight growth for from 5 to 14 days and survived from 15 to 45 days. The larger rats responded more quickly to the vitamin B complex deficiency than did the small animals.

Alleviation of vitamin B deficiency in the rat by certain natural fats and synthetic esters, W. D. Salmon and J. G. Goodman (*Jour. Nutr.*, *13* (*1937*), *No. 5, pp. 477–500, figs. 2*).—Studies were made at the Alabama Polytechnic Institute to determine the effect on rats of adding various fats to a vitamin B-free diet by comparing the weight gains and the time required for the rats to develop beriberi. The percentages of fat retained in the body and the refractive indexes were determined.

Coconut fat was found to be the most effective of the natural fats, with cottonseed and pecan oils slightly less effective in delaying the onset of beriberi and lard and butter in producing weight gain. Butter, olive oil, and beef fat were found to be the least effective in delaying the development of beriberi. Of the synthetic esters of different fatty acids, the greatest growth was produced in the rats receiving a diet containing 23 percent glyceryl caprylate, glyceryl caproate, or iso-caproate. It is established that the effectiveness of esters of single fatty acids in alleviating the vitamin B deficiency symptoms depends upon the length of the carbon chain of the fatty acid, the 8-carbon acid being the most effective. The addition of a vitamin B concentrate proved more effective in increasing the rate of weight gain and delaying the onset of beriberi than the use of increased amounts of autoclaved yeast.

The vitamin G content of some foods, H. Levine and R. E. Remington (*Jour. Nutr., 13 (1937), No. 5, pp. 525–542*).—With the Bourquin-Sherman (E. S. R., 66, p. 410) and the Munsell (E. S. R., 66, p. 596) flavin-deficient diets, the flavin content of various foods was determined. Expressed in terms of Bourquin-Sherman units of flavin, dried brewer's yeast contained 20–21 units, dried whole milk 5.3, soybeans 2.4–3.2, and cottonseed meal 2.9 units per gram. The flavin in soybeans and cottonseed meal was stable to pressure cooking at 15 lb. for 30 min.

[Vitamin C studies at the New York State Station] (*New York State Sta. Rpt. 1937, pp. 29, 30*).—Brief progress reports (E. S. R., 76, p. 726) are given on the changes in the vitamin C content of Northern Spy apples prepared as sauce, baked, and made into pie; and of the factors controlling the vitamin C content of raw, cooked, stored, and frozen vegetables.

Tomato variety and strain differences in ascorbic acid (vitamin C) content, W. A. Maclinn, C. R. Fellers, and R. E. Buck (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 543–552*).—In this contribution from the Massachusetts Experiment Station the vitamin C content of 98 distinct varieties or strains of tomatoes grown under constant field conditions was determined, using the Bessey-King modification (E. S. R., 71, p. 137) of the Tillmans method. The values obtained varied from 74 to 249 international units of vitamin C per ounce. Different strains of the same variety of tomato contained varying amounts of vitamin C, and the size and the degree of ripeness had no significant effect on the vitamin C content. The results indicate that ripe tomatoes may be stored at room temperature for several days after harvesting with little loss of vitamin C content.

Ascorbic acid content of Florida citrus fruits, L. M. Beacham and V. B. Bonney (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 3, pp. 517–527*).—The authors of this contribution from the U. S. D. A. Food and Drug Administration give detailed data obtained in the determination of the ascorbic acid content of oranges taken from 38 groves at intervals usually of 2 weeks and in most cases covering the period from a very immature condition to "some time after full maturity." The determinations were made by titration with 2,6-dichlorophenolindophenol, and frequent comparison was made with a method in which excess of 0.01 N iodine is added to 20 cc of orange juice plus 4 cc of sulfuric acid in the presence of starch-paste indicator, followed by excess of 0.01 N thiosulfate, which is titrated to a light-blue end-point color with the 0.01 N iodine.

Expressed as milligrams of ascorbic acid per cubic centimeter of juice, the content of 21 varieties of oranges of the 1936–37 crop ranged from 0.3 to 0.77 mg, 4 of grapefruit from 0.31 to 0.5, 3 of lemons from 0.22 to 0.45, 2 of lime from 0.08 to 0.33, and 1 each of kumquat from 0.13 to 0.24, limequat from 0.18

to 0.24, calamondin from 0.33 to 0.35, tangerine from 0.10 to 0.3, and Satsuma from 0.22 to 0.36 mg per cubic centimeter, respectively. A variation of from 0.32 to 0.54 mg of ascorbic acid per cubic centimeter of juice is reported for individual oranges picked from one grove on the same day.

The oxidation of ascorbic acid and its reduction in vitro and in vivo, H. BORSOOK, H. W. DAVENPORT, C. E. P. JEFFREYS, and R. C. WARNER (*Jour. Biol. Chem., 117 (1937), No. 1, pp. 237–279*).—The reversible oxidation-reduction potential of ascorbic acid was determined in vitro and the findings were applied to a study of the fate of dehydroascorbic acid in vivo. The work is divided into physiochemical measurements, nutrition experiments, physiological experiments, and a study of the interaction of oxidized ascorbic acid and glutathione. The main features of the irreversible change in dehydroascorbic acid are also described. The results of the nutrition experiments show that dehydroascorbic acid is protected in vivo from rapid transformation to "the antiscorbutically impotent diketogulonic acid."

The excretion of vitamin C by human beings in South India, S. RANGANATHAN and G. SANKARAN (*Indian Jour. Med. Res., 25 (1937), No. 1, pp. 29–37, fig. 1*).—Among 34 subjects of various ages, the majority of whom were natives living in Coonoor, South India, values obtained for the excretion of vitamin C before and after the administration of test doses of ascorbic acid and/or orange juice showed a response to the first test dose by significantly greater excretion of ascorbic acid in only one instance. The initial level of vitamin C could not be used as an index of the degree of unsaturation, for the responses to the test dose were not proportional to the initial level of excretion. In two subjects who were given saturation tests a peak in excretion was not reached until the vitamin intake exceeded 1,000 mg, although the initial level in one subject was more than twice that of the other. As a method of expressing vitamin C subnutrition, the total amount of vitamin excreted when the peak was reached was calculated as the percentage of total intake at that time and the value subtracted from 100. As thus calculated, the degrees of vitamin C subnutrition in the two cases were 87.88 and 89.67 percent, respectively.

Among six lactating women, the vitamin C content of whose milk was determined and the response to test doses of the vitamin as well, three with a low content in the milk showed a quicker response to the test dose than the three whose milk was richer in vitamin C.

Nutrition surveys: A simplified procedure for the vitamin-C urine test, L. J. HARRIS and M. A. ABBASY (*Lancet [London], 1937, II, No. 25, p. 1429, fig. 1*).—A procedure which has been found satisfactory and sufficiently accurate for the routine surveys of the nutritional status of school children with respect to vitamin C is described briefly.

At 9 a. m. or on arrival at school the subjects are instructed to urinate, the specimens being collected in bottles but discarded. The next specimens are obtained at noon and titrated immediately. If necessary to pass urine in the interim it is kept and titrated with the noon sample. The same procedure is followed on the second and if possible on the third day. Following this, for 1 or 2 days a standard test dose, 70 mg of ascorbic acid per stone (14 lb. body weight), is administered at about 10 a. m. and the urine collected on the same afternoon from 2 to 4 or 5 p. m.

Control tests carried out on large groups of volunteer subjects on different levels of vitamin C intake have shown that the 3-hr. morning specimen represents about one-eighth of the 24-hr. excretion of vitamin C, and that the afternoon collection after a test dose is adequate to show whether or not there has been any marked response to the test dose. The standard for comparison

is based on the excretion of 13 mg per day (resting level) and a response to the test dose on the first or second day. The 13-mg standard represents the excretion following the consumption of the reputed "minimal-optimum" intake of 25 mg per 10 stone body weight, this being the amount necessary to prevent a tendency to increase capillary fragility.

When is capillary fragility a sign of vitamin-C subnutrition in man? G. F. Göthlin (*Lancet [London], 1937, II, No. 12, pp. 703–705*).—The author reviews the development of the capillary resistance test for vitamin C subnutrition, calling attention particularly to the report by Geschwind and Rundqvist (E. S. R., 74, p. 728), describes the technic which he now follows, and discusses the limitations of the test and requirements of vitamin C. From simultaneous capillary tests and blood determinations it is concluded that the ascorbic acid blood value which corresponds to the borderline between normal and subnormal strength of the capillaries must be below 1.4 mg per liter and of the order of magnitude of about 1 mg. Values from 1.5 to 4 mg would give no capillary reaction. In countries where values seldom fall as low as 1 there is little use for the capillary test, but in countries like Sweden, with low supplies of vitamin C-containing foods, during the winter thousands develop capillary fragility. In such countries the capillary test is of considerable value in dealing with the most severe deficiencies. In mass investigations to determine whether enough ascorbic acid is present in the regular dietary of institutions a simultaneous double arm test with the 50-mm over-pressure only is recommended, but in mass investigations on school children coming from homes with varying vitamin C supplies two double arm tests are advised.

In discussing possible requirements of vitamin C the author states that he "cannot think it justifiable, merely from estimates of the ascorbic acid content of the blood of the healthy population of a certain small area of the world, to decree where the borderline for man in general lies between a sufficient supply of ascorbic acid and an insufficient supply. To make such an assumption would be to proceed in much the same spirit as was shown when, from the well-known determination by C. Voit that the 'average German workman' consumed 118 g of protein per 24 hr., the conclusion was drawn that a daily consumption below 118 g was insufficient."

Some unexpected results in an attempt to produce experimental scurvy, S. Weiss (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 388–390*).—Evidence is presented to show that ascorbic acid is contained in some varieties of hay which may be used in the experimental scurvy-producing diet composed of oats, hay, and water. Biological tests with guinea pigs showed that the inclusion in the diet of South Park, Middle Park, North Park, and Gunnison types of mountain hay and alfalfa prevented scurvy symptoms, and the animals were maintained in a good state of nutrition.

Scurvy and the requirements of native mine labourers for the antiscorbutic vitamin.—A preliminary study, F. W. Fox (*Transvaal Mine Med. Off. Assoc., Proc., 15 (1936), No. 172, pp. 59–72, figs. 3*).—In this preliminary report the author reviews observations on the metabolism, storage, and excretion of vitamin C; presents typical results on the reserves of vitamin C as determined by the Harris test dose method among Europeans and natives in the Transvaal; and discusses the possible significance of the low findings obtained. The distribution of ascorbic acid in the common foodstuffs available is tabulated, and practical suggestions are given for the prevention of scurvy. In regard to requirements of vitamin C as related to saturation the following statement is made:

"Taking the evidence as a whole, we think it may be concluded that, whilst it is evidently quite possible for an individual to live for considerable periods on a hand-to-mouth basis as far as this vitamin is concerned, without any appreciable reserves but without any apparent tax upon his health, it is difficult to believe that such a fine adjustment to necessity can be very satisfactory in the long run, or that it can enable the individual to exert his full powers either of physical endurance or of resistance to illness."

Asymptomatic scurvy: Its relation to wound healing and its incidence in patients with peptic ulcer, T. H. Ingalls and H. A. Warren (*New England Jour. Med., 217 (1937), No. 11, pp. 443–446*).—The ascorbic acid content of the blood plasma of 18 out of 20 patients with gastric or duodenal ulcer ranged from 0 to 0.6, with an average of 0.19 mg per 100 cc, as compared with a normal range of from 0.6 to 2 mg per 100 cc. Two normal controls gave values of 1.5 and 1.45 mg per 100 cc, respectively. Each of the other 2 patients, who had taken citrus fruits frequently during their illness, gave values of 1.15 mg per 100 cc, while in most of the other cases the intake had been inadequate. None of the patients showed evidence of clinical scurvy, but 8 had had gastrointestinal hemorrhages in the past.

The theoretical importance of these findings in relation to the healing of peptic ulcer, to the bleeding of the ulcer, and to surgical intervention is discussed, with the recommendation that the clinician "make sure that patients with peptic ulcer are receiving an adequate amount of vitamin C."

Scurvy and carditis, S. Taylor (*Lancet [London], 1937, I, No. 17, pp. 973–979, figs. 10*).—The examination of mildly and severely scorbutic guinea pigs revealed the presence of heart lesions in the mitral valve, auriculoventricular junction, the perivascular areas in the myocardium, and the papillary muscles, resembling those seen in children suffering from rheumatic carditis only in that they show a diffuse nonpurulent carditis without gross valvular vegetations. The incidence or severity of the lesions was not increased by the intradermal injection of hemolytic or green streptococci, but the injected organisms were found in the mitral valves, the auricular and ventricular muscle, and the auriculoventricular junction. The lesions persisted in the animals after the scorbutic condition had been cured.

Ascorbic acid metabolism in tuberculosis, F. H. Heise and G. J. Martin (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 642–644*).—The vitamin C excretion in the urine of 44 patients with minimal, moderately-, and far-advanced tuberculosis was determined by the method developed by Tillmans et al. (E. S. R., 69, p. 7) and Harris and Ray (E. S. R., 70, p. 426.)

In 6 cases, 5 with active tuberculosis and 1 of questionable activity, the vitamin C excretion ranged from 0 to 5 mg daily. In 14 cases, 5 of which were inactive and 9 active, the daily excretion was from 5 to 8 mg and in 21 cases, of which 14 were inactive and 7 active, the daily excretion ranged from 8 to 14 mg. In 13 cases, of which 12 were inactive and 1 active, the excretion was over 14 mg daily. "This shows a rough parallelism between activity in uncomplicated tuberculosis and the daily excretion of ascorbic acid on a controlled diet."

Following a 2-week period during which 4 oz. of orange juice containing 55 mg of ascorbic acid were given daily, 14 cases of inactive tuberculosis showed an increase in excretion of ascorbic acid above 16 mg daily (considered to be a positive response), whereas in 10 cases, 8 of which were active, a negative response was shown. "It would seem that between 55 and 138 mg of ascorbic acid daily are required to bring a tuberculous patient into equilibrium as regards vitamin C nutrition."

Vitamin C nutrition in pulmonary tuberculosis, G. J. MARTIN and F. H. HEISE (*Amer. Jour. Digest. Diseases and Nutr., 4 (1937), No. 6, pp. 368–374, figs. 3*).—The observations noted above have been extended to a total of 150 tuberculous patients and 15 normal nontuberculous subjects.

Among 116 subjects on the sanatorium diet with no supplements, 10 normal subjects were found to be excreting ascorbic acid within a range of from 17 to 44 mg daily, while of the tuberculous individuals 16 excreted from 14 to 18, 45 from 8 to 14, 29 from 5 to 8, and 16 from 0 to 5 mg daily. When grouped according to the severity of the tuberculosis, the deficiency in vitamin C, as shown by low output, paralleled roughly the extent and activity of the tuberculous involvement.

In further saturation tests, 21 out of 41 tuberculous patients became saturated on 4 oz. of orange juice (55.2 mg ascorbic acid) daily for 2 weeks and 20 remained unsaturated. Of those who became saturated, all but one were among the cases classified as inactive. Of those who were not saturated at the end of 2 weeks, one with advanced pulmonary tuberculosis gave no positive response even after 220 mg of ascorbic acid daily. The others eventually became saturated, although only after large dosages. The negative results in attempts to saturate tuberculous patients are attributed to one of two factors, alteration in the intestinal chemistry through failure of absorptive mechanisms or destruction by bacteria or increasing demands for ascorbic acid by the tissues.

Vitamin-D and provitamin-D contents of some varieties of Utah-grown wheat, J. E. GREAVES and H. NIELSON (*Food Res., 1 (1936), No. 6, pp. 495–499*).—In this contribution from the Utah Experiment Station six varieties of wheat grown on the same soil and under similar conditions were assayed for vitamin D and provitamin D. Rachitogenic rats were given supplements of the wheat, irradiated in the provitamin D tests and nonirradiated in the vitamin D tests, and after 5 days phosphorus determinations were made on the blood plasma.

The degree of healing, as determined by the line test, was slight when 1 g of nonirradiated or 0.5 g of the radiated wheat was fed but became more pronounced when the dosages were raised to 1.25 and 0.75 g, respectively. Blood phosphorus values were below normal even in the rats receiving 1.25 g of wheat daily. The authors point out that "the number of samples analyzed is too small to permit the drawing of definite conclusions, but the evidence points to the conclusion that the provitamin D content of wheat varies with the variety."

A comparison of the hypervitaminoses induced by irradiated ergosterol and fish liver oil concentrates, A. F. MORGAN, L. KIMMEL, and N. C. HAWKINS (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 85–102, figs. 5*).—Eight series of feeding tests were conducted on groups of rats receiving the synthetic diet containing normal calcium and phosphorus, described in a previous study (E. S. R., 74, p. 889), and supplemented by from 10 to 10,000 international units of vitamin D as fish-liver oil concentrates, irradiated ergosterol, or crystalline calciferol and from 10 to 23,000 international units of vitamin A in the form of carotene. The rate of growth, ash content of the femurs, serum calcium and inorganic phosphorus, and ash, calcium, and phosphorus content of the soft tissues were determined at the end of the feeding periods, which varied from 21 to 57 days. The progress of the changes induced by the administration of the excess amounts of the supplements was measured in representative animals at the end of 14, 28, 43, and 57 days on the diet. The effect of sex on hypervitaminosis D was noted in two series of tests.

The results show that the vitamin D of irradiated ergosterol exerted greater toxic effects at levels of 4,000 and 10,000 units of vitamin D daily than did the

vitamin D of fish-liver oil concentrates. The harmful effects of irradiated ergosterol were lessened but not entirely eliminated by the administration of excess amounts of vitamin A varying from 250 to 1,000 times the amount required under normal conditions. The male and female rats were nearly equally susceptible to the toxic action of the irradiated ergosterol.

The influence of rachitogenic and antirachitogenic diets on the incidence of spontaneous infections in albino rats, J. THOMPSON (*Jour. Infect. Diseases, 59 (1936), No. 3, pp. 253–257*).—The incidence of spontaneous infections involving the middle ear and the lung was studied in 500 rachitic and nonrachitic rats receiving iodine supplements.

It would appear that in the presence of adequate iodine the animal has a better defense mechanism, since the rachitic rats receiving a vitamin D-free diet and no supplement showed an increase in the incidence of infection. No significant difference was evident in rats receiving diets containing iodine irrespective of the amount of vitamin D supplied.

The relation of vitamin E to the anterior lobe of the pituitary gland, M. M. O. BARRIE (*Lancet [London], 1937, II, No. 5, pp. 251–254, figs. 7*).—The pathological changes produced in female rats and their offspring by maintenance on a vitamin E-deficient diet are described. It is concluded that vitamin E is necessary in the rat for normal functioning of the anterior lobe of the pituitary gland.

The interrelationship between dietary egg white and the requirement for a protective factor in the cure of the nutritive disorder due to egg white, H. T. PARSONS, J. G. LEASE, and E. KELLY (*Biochem. Jour., 31 (1937), No. 3, pp. 424–432, pl. 1, figs. 5*).—In further experiments conducted at the Wisconsin Experiment Station (E. S. R., 78, p. 134), the authors demonstrate that the greater the concentration of egg white in the ration of experimental rats and chicks the greater the amount of a certain potent factor necessary to cure the resulting nutritional disorder. The chick requirement for the factor is higher than that of the rat. "It has not yet been demonstrated that the protective factor is a vitamin or that it is required in normal nutrition."

A comparison in five types of animals of the effects of dietary egg white and of a specific factor given orally or parenterally, J. G. LEASE, H. T. PARSONS, and E. KELLY (*Biochem. Jour., 31 (1937), No. 3, pp. 433–437, pl. 1*).—In continuation of the paper noted above, the authors compared the effects produced on the guinea pig, the rabbit, and the monkey with those on the chick and the rat upon the addition of egg white to the diet. A definite similarity was noted in the manifestations of the nutritive disorder among the chick, the rat, the rabbit, and the monkey. The guinea pig showed only transient nonspecific symptoms.

The lack of correlation between hypersensitivity to egg white and symptoms of injury, L. ALMON and H. T. PARSONS (*Jour. Allergy, 8 (1937), No. 6, pp. 547–559*).—In continuation of the paper noted above, the authors present the results of precipitin tests, tests for anaphylaxis, and skin tests made on rats, rabbits, guinea pigs, and monkeys as evidence to support the view that the skin lesions attributed to egg white are nonallergic in character.

The treatment of diabetes mellitus, E. P. JOSLIN (*Philadelphia: Lea & Febiger, 1937, 6. ed., rev., pp. 707, figs. 22*).—In this revision of the well-known handbook, written in cooperation with H. F. Root, P. White, and A. Marble as in the previous edition (E. S. R., 75, p. 138), the recent changes in the treatment of diabetes by the use of protamine insulin necessitated the addition of two new chapters and numerous changes in the text. As noted in the preface,

protamine insulin has opened the door into the fourth epoch of diabetic therapy—the Hagedorn era.

The occurrence of "mottled enamel" of teeth in Alberta and its relation to the fluorine content of the water supply, O. J. Walker and E. Y. Spencer (*Canad. Jour. Res., 15 (1937), No. 7, Sect. B, pp. 305–314, figs. 2*).—In this first report of the occurrence of mottled enamel in Canada, the results of a survey show the presence of the condition in a relatively light form in two sections of the Province of Alberta. Analysis of the water supply in the endemic areas showed that, in general, the deep wells are high in fluorine.

Pellagra in African children, H. C. Trowell (*Arch. Disease Childhood, 12 (1937), No. 70, pp. 193–212, figs. 3*).—This paper presents the findings of a detailed investigation of the clinical, biochemical, and pathological changes noted in 26 hospitalized children aged from 6 mo. to 4 yr. with "infantile pellagra." This endemic disease, which is fatal within 2 or 3 mo. if untreated and is believed to be a new clinical entity, is known in Africa as "Gillian's edema," "Williams' disease," or "malnutritional edema," and resembles in certain respects the pink disease described by clinicians in England. Its characteristics are severe edema, the presence of a rash which differs in some respects from that in pellagrous adults, diarrhea, dysentery, and in some cases fatty stools.

The treatment consisted of a dietary regime during which the corn in the previously inadequate diet was replaced by wheat and rice, and marmite, eggs, liver, and 1 pt. of milk were added, supplemented by large doses of iron and also calcium lactate. Only 9 of the cases, all of whom had had the disease for over a month before entering the hospital, failed to respond to the dietetic treatment.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1937, pp. 10–13*).—This report (E. S. R., 76, p. 731) includes summaries of a completed study on the serviceability of wool blanket fabrics (E. S. R., 77, p. 891), a cooperative study with the Bureau of Plant Industry on the deterioration of wool fabrics by micro-organisms, a study of the serviceability of sheetings made from cottons grown under irrigated and nonirrigated conditions, and progress reports of studies on the suitability of various starches for cotton fabric finishing and on quality guides for purchasers of clothing and household textiles.

Fireproofing fabrics, M. Leatherman (*U. S. Dept. Agr., Farmers' Bul. 1786 (1937), pp. II+9, figs. 8*).—Formulas for preparing fireproofing solutions are given, together with directions for their application in the home. A mixture of 3 oz. of boric acid and 7 oz. of borax in 2 qt. of hot water is recommended for fireproofing clothing and inflammable household fabrics such as curtains, draperies, rugs, and ironing board covers, and is applied either by dipping the article into the solution or by spraying. The fireproofing materials are removed from the fabric by laundering and by rain.

Utility of jack rabbit and cottontail skins, C. E. Kellogg (*U. S. Dept. Agr., Misc. Pub. 289 (1937), pp. 8*).—The results of a study conducted by the Bureau of Biological Survey are reported to show that the skins of whitetail, blacktail, and cottontail rabbits collected in North Dakota, Nebraska, and Oklahoma during the winter of 1935–36 were not suitable for furriers' purposes, but that sample hats made from 100 percent of each of the three kinds were judged to be of fair quality, and of excellent quality when made from a blend containing 40 percent wild-rabbit fur with other hatters' fur.

HOME MANAGEMENT AND EQUIPMENT

Economic studies [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1937, pp. 6–10*).—This report of the Division of Family Economics summarizes the data of the Works Progress Administration study (E. S. R., 76, p. 717), dealing with the average total income of nonrelief farm families and of families living in small cities, preliminary findings concerning the distribution of the income, and a summary of the expenditures for food of low-income city families, based on 3,500 dietary records.

Farm family living outlook for 1938 (*U. S. Dept. Agr., Misc. Pub. 297 (1937), pp. 11*).—The portions of the report of the conference on the Farm Family Living Outlook for 1938, conducted by the Bureaus of Agricultural Economics and Home Economics and the Extension Service, particularly significant for planning farm family living, are condensed in this pamphlet, which contains brief discussions on the outlook from the general and regional viewpoints for expenditures for food, automobile, clothing, and the fixing up of the home, and on adjustments in financial plans for 1938.

Housing and household equipment [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1937, pp. 13, 14*).—This progress report (E. S. R., 76, p. 732) includes data on the cost of cooking with electricity, kerosene, gasoline, manufactured and bottled gas, and on an accelerated life test carried out on two ice-cooled cabinets and two electric refrigerators.

Buying household goods by contract, L. BANE and R. C. FREEMAN (*Jour. Home Econ., 29 (1937), No. 9, pp. 598–602*).—The use of the information gained from home account records of family expenditures for obtaining reduced costs by the negotiation of advance contracts between the household buyer and the various merchants is discussed in this paper.

MISCELLANEOUS

Golden Anniversary Annual Report, Colorado Experiment Station, 1936–37, E. P. SANDSTEN (*Colorado Sta. Rpt. 1937, pp. 62, figs. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-ninth Annual Report [of Georgia Station], 1937, H. P. STUCKEY (*Georgia Sta. Rpt. 1937, pp. 70, figs. 20*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-sixth Annual Report of the New York State Agricultural Experiment Station, [1937], U. P. HEDRICK (*New York State Sta. Rpt. 1937, pp. 112*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Publications available for free distribution (*Idaho Sta. Circ. 77 (1937), pp. 4*).—A list of the station and extension publications available as of November 1937.

Publications on agricultural economics [and agricultural production] (*Kansas Sta. Circ. 182 (1937), pp. 3*).—Available bulletins and circulars of the station in these fields are listed.

NOTES

Arkansas University and Station.—As a step toward the expansion of the research work at the four substations, State funds have been used to provide a cooperative research supervisor at each substation. Their work will deal with the outlying experiments in cooperation with farmers and with surveys and studies with agricultural economics problems conducted in cooperation with the department of rural economics and sociology. Fred E. Delzell and John W. White have been appointed to these positions at the Fruit and Truck and the Cotton Substations. J. D. Paul has been appointed technical assistant at the Rice Substation.

A study of the effect of humidity, precipitation, temperature, and other weather elements on the growth, performance, and quality of cotton has been begun at the Cotton Substation. Measurements on the growth, branching, boll size, boll number, blooming, and picking dates will be taken at 10-day intervals during the growing season, and records of humidity, temperature, and rainfall, as well as general weather conditions, will be made daily.

R. W. Hess has been appointed instructor in forestry, and L. B. Zehweiger instructor in bacteriology and veterinary science.

Connecticut College and Storrs Station.—Work has been begun on a $150,000 college library, which is expected to be ready for occupancy next September.

The American Academy of Arts and Sciences has made a grant to Dr. Walter Landauer, station geneticist, for the purchase of a special type of precision balance to be used in connection with embryological work on creeper fowl.

Delaware Station.—Dr. Kenneth J. Kadow, associate pathologist in horticulture in the Illinois Station, has been appointed associate plant pathologist.

Georgia Station.—W. E. Hendrix has been appointed assistant agricultural economist, and L. C. Olson assistant agronomist.

Idaho University and Station.—Julius E. Nordby, associate professor and assistant in animal husbandry, has been appointed director of the U. S. D. A. Regional Sheep Breeding Laboratory at DuBois. Walter Virgin has been appointed associate plant pathologist.

Purdue University.—Contracts have been awarded for a new three-story agricultural chemistry laboratory, 55 by 110 ft., and the completion of the horticultural building by an addition of 126 by 60 ft.

Kansas College and Station.—Dr. L. M. Roderick, chairman of the department of animal pathology and hygiene at the North Dakota College and Station, has been appointed head of the department of pathology in the division of veterinary medicine.

Maine University and Station.—Two fellowships have been established at the university. One by the Maine Canners' Association is designed to effect cooperation between the association and the station in the development of hybrid seed corn for commercial planting. Under the supervision of the station plant breeder, the holder of this fellowship will have charge of the details of hybrid seed production for the canners and will also assist in the station re-

search with hybrid sweet corn development. The second fellowship was established by the Eastern States Farmers' Exchange for the purpose of promoting research on stem-end browning of potatoes.

The station has undertaken a soil testing service.

Maryland University.—A building program involving $2,380,341 is to be begun, derived from a W. P. A. grant of $1,135,139, a balance of $985,202 remaining from State appropriations, and a private gift of $260,000. Of the total amount, $1,219,263 is available for use at College Park, $930,358 for the professional schools in Baltimore, and $250,000 for Princess Anne Academy, where there will be built a mechanics arts building to cost $46,944, an administration and home economics building to cost $91,988, and a gymnasium and recreation building to cost a like amount.

The campus at College Park is to be relandscaped, with a new system of roadways and plantings. New construction includes the use of $318,900 for an administration building, $125,360 for a poultry building and plant, $114,360 for a new home economics building, $197,765 for an additional men's dormitory, $37,000 for greenhouses, $33,000 for an infirmary, $326,496 for additions to the engineering building and the dining hall, $50,562 for a shops and service building, and $15,730 for remodeling the dairy building.

Minnesota University and Station.—Construction is under way on a new forestry building, for which $250,000 was granted by the last legislature. This will be a four-story building, 153 by 62 feet. One floor will be given over to the Lake States Forest Experiment Station and the remaining space to the division of forestry, with classroom and laboratory space and an auditorium for about 500 students, and a forestry museum and library. Though of modern fireproof construction, the building will utilize considerable wood for finishing, including oak for the first floor hall and general offices and pine paneling for the museum and library.

A $5,000 permanent dairy exhibit at the 1937 State Fair represented the initial expenditure from a $20,000 grant made by the last legislature to be expended by the university dairy division with the approval of the State dairy industries committee. The entire fund must be used before June 30, 1938, for research relating to the marketing of dairy products, for exhibits, and for organizing the dairy industry in Minnesota.

Montana Station.—A laboratory is being constructed by the animal husbandry department, which will include equipment to secure scouring data, fiber tests, and uniformity studies of wool.

Nebraska Station.—Recent appointments include Dr. Ruth M. Leverton as assistant professor of home economics nutrition research for a study of the nutritional status and food consumption of college women; Dr. James H. Jensen, plant pathologist and physiologist of the Puerto Rico Federal Station, as associate plant pathologist; and Richard E. Baker as instructor and assistant in horticulture.

Rutgers University and New Jersey Stations.—The auditorium in the agricultural administration building has been converted into a library of 75,000-volume capacity, taking care of the needs of the College of Agriculture and stations for years to come. The collection of Dean and Director J. G. Lipman, valued at more than $5,000, has been donated to this library.

Property acquired in 1935 for the use of the College of Agriculture and stations and consisting of 13 acres of land adjoining the college farm, a 10-room house and other buildings, and a garage is being converted into permanent quarters for the departments of agricultural economics, fertilizer and feeding

stuffs control, entomology, and water and sewage research. An up-to-date print shop will also be installed on the premises.

Under a State appropriation of $20,000 for research on Bang's disease and mastitis, work on the former is being carried on at the stations and on the latter at the North Jersey Substation.

Cornell University and Station.—Fire on January 21 destroyed the horse barn erected in 1912 and valued at $50,000. All livestock was saved.

Through a gift by Mrs. Ella S. Denison of Denver, Colo., a fund of $50,000 has been made available, which will be known as the Henry Strong Denison Fund for Agricultural Research. The principal is to be permanently invested and the income used to provide grants, scholarships, or fellowships to students and faculty members deemed specially qualified to carry on this type of research.

New York State Station.—A long-time feeding experiment has been set up in the dairy herd to test the value of vitamins and minerals added to commercial feeding stuffs now being used extensively by the State. Every other calf born in the station herd will be raised and subsequently fed as a mature cow according to the usual feeding standards, while all other calves will be given in addition to the standard ration cod-liver oil fortified with vitamins A and D, steamed bonemeal, and kelp. It is estimated that the experiment will require 10 years for completion.

North Dakota College and Station.—A modern miniature machine for making macaroni has been acquired for experimental work.

Ohio Station.—Recent appointments include as assistants John A. Bastian in forestry, Florence Petzel in home economics, and Paul A. Loiselle in agricultural engineering.

Oklahoma College and Station.—The station is taking over a 10-acre nursery on its farm, which has been operated by the State Forest Service for the purpose of propagating trees for distribution to farmers to use for wood-lot and windbreak plantings. The nursery will now be used for the production of ornamental materials for the campus, teaching purposes, and conducting various types of research relating to plant propagation and farm wood-lot problems.

Henry Dunlavy has been appointed associate professor of agronomy and given charge of the cotton program, which includes the establishment of a cotton experiment station in southwestern Oklahoma and the formulation of plans for cotton improvement for the entire State.

Pennsylvania College and Station.—Ground was recently broken by the Governor to mark the initiation of the $5,000,000 building program of the college. New buildings will be erected for agricultural science, agricultural engineering, chemistry and physics, education, electrical engineering, forestry, and the library. In addition a central unit of the liberal arts building will be constructed, joining the north and south wings now is use, and the central unit of the mineral industries building will be completed.

The Pennsylvania Wildlife Research Unit has been established at the college, effective March 1, with the cooperation of the U. S. D. A. Biological Survey and the State Game Commission. Logan J. Bennett has been detailed by the Biological Survey for service at State College.

Dr. F. P. Weaver has retired as head of the department of agricultural economics. Harold M. Steiner has been appointed instructor in economic entomology, with headquarters at the Arendtsville Fruit Research Laboratory.

South Carolina Station.—Two greenhouses, each 32 by 100 ft., and a head house, 20 by 80 ft., have recently been completed for horticultural and agronomic research. The Truck Substation has recently acquired 200 acres of land, part of

which will be used for field experiments. Two office and laboratory buildings have been completed at the Pee Dee and Edisto Substations at a cost of approximately $16,000 and $10,000, respectively.

Tennessee University and Station.—Dr. Frank Lamson-Scribner, professor of botany and botanist from 1888–94 and director of the station from 1890–94, died in Washington, D. C., on February 22 at the age of 86 years. A native of Massachusetts, he was graduated from the Maine State College of Agriculture in 1873 and received the LL. D. degree from the University of Maine in 1920. His principal service was with the U. S. Department of Agriculture, beginning in 1885 as special agent in charge of the division of mycology. He rejoined the Department in 1894 as chief of the division of agrostology, leaving in 1901 for 3 years' service as chief of the Philippine Bureau of Agriculture. Upon his return, he was given charge of the Department's exhibits at fairs and expositions. He was the author of numerous treatises and shorter articles, among them Grasses of Tennessee, 1894, and American Grasses (three volumes), 1897–1900.

Utah Station.—Dr. R. H. Walker, conservationist at the U. S. D. A. Intermountain Forest and Range Experiment Station, has been appointed director.

West Virginia University and Station.—William E. Rumsey, a member of the entomological staff since 1893, died February 16 at the age of 72 years. A native of New York and a graduate of Cornell University in 1891, he was originally appointed assistant entomologist, but in 1913 was made director of the newly organized State Crop Pest Commission. When the commission was merged with that of the State Department of Agriculture, he was retained as State entomologist, holding this position until 1934. Throughout his period of service, which by far exceeded that of any other person associated with the station, he was also its photographer.

Wisconsin University and Station.—A fund to be derived from a sale of a 280-acre farm and other possessions has been given the university by Gurine Gjermundsen, who died December 20, 1937. The fund is to be kept intact to provide for the awarding of the Gurine Gulsteen Research Fellowship for studying farm problems.

Max La Rock has been appointed assistant professor of agricultural engineering. Gilbert H. Ahlgren, assistant in agronomy, has been appointed to a similar position in the New Jersey Stations, where he will conduct general pasture research on the breeding of white clover.

Prospective International Congresses.—Announcement has been made of the following: The Seventh International Congress of Entomology in Berlin, August 15–20, 1938; the Thirteenth International Veterinary Congress, the Fifth International Congress for Experimental Cytology, and the Sixteenth International Physiological Congress, all in Zürich, Switzerland, in August 1938; the Seventh International Congress for Scientific Management in Washington, D. C., September 19–23, 1938; the Seventh World's Poultry Congress and Exposition in Cleveland, Ohio, from July 28 to August 7, 1939, with preopening exercises in Washington, D. C.; the Third International Congress for Microbiology in New York City, September 2–9, 1939; the Eighth International Congress of Genetics in Great Britain in 1939; the Ninth International Seed Testing Congress in the United States in 1940; and the Twelfth World's Dairy Congress in Wien (Vienna) in 1940.

New Journals.—*Studies of the Institutum Divi Thomae* is being issued quarterly at the Athenaeum of Ohio, established at Cincinnati in 1935 to carry on fundamental research in the natural sciences. The initial number contains the following: Topical Applications of Vitamin A and of Carotene, I, II, by A. C. Helmer and C. H. Jansen (pp. 1–15); The Stimulation of Yeast Respira-

tion by Radiations, [I], II, by J. C. Fardon et al. (pp. 17–39); A Respiratory Stimulating Factor, by J. C. Fardon and M. V. Ruddy (pp. 41–51); A Study of Stimulation of Growth, Respiration, and Fermentation by Bios and Bios-like Substances, by R. J. Norris and M. V. Ruddy (pp. 53–64); Biological Assay of Dialyzed Fractions of Bios, by R. J. Norris and M. J. Hart (pp. 65–78); Note on the Ultra-Violet Absorption Spectra of Bios and Other Growth Promoting Preparations, by J. R. Loofbourow et al. (pp. 79–81); The Absorption of Vitamin D Through the Skin, I, II, by A. C. Helmer and C. H. Jansen (pp. 83–108); The Development of Plant Pigments in Seedlings Grown in the Dark, by W. A. Beck (pp. 109–116); and Phototropic Response of *Drosophila melanogaster* and Its Mutants, by J. C. Fardon et al. (pp. 117–135).

Growth, "a journal for studies of development and increase", is being published by an editorial board composed of F. S. Hammett, chairman, S. A. Courtis, University of Michigan, Ann Arbor, Mich., secretary-treasurer, and 18 section editors, among them P. W. Gregory for genetics, H. S. Reed for plant growth, S. Brody for nutrition, W. R. Graham for vitamins, and L. Loeb for hormones. A volume will contain at least 400 pages. The initial issue, presented as numbers 1 to 6, contains 6 original articles as follows: An Improved Technique for Measuring Head Features, by C. B. Davenport (pp. 3–5); On the Motion of Growth—XVII, Theoretical Foundations, by N. C. Wetzel (pp. 6–59); Relativity of Physiologic Time and Physiologic Weight, by S. Brody (pp. 60–67); The Role of *l*-Aspartic Acid in Developmental Growth, by F. S. Hammett and H. Schlumberger (pp. 68–77); Experimental Findings Concerning the Electro-dynamic Theory of Life and an Analysis of Their Physical Meaning, by F. S. C. Northrop and H. S. Burr (pp. 78–88); and Glutathione Concentration and Hereditary Size—VI, Comparative Post-Hatching Studies With Barred Plymouth Rocks and White Leghorns, by P. W. Gregory, H. Goss, and V. S. Asmundson (pp. 89–102).

The Journal of Wildlife Management is being issued quarterly at Menasha, Wis., by the recently organized Wildlife Society, primarily for the publication of original articles bearing on wildlife research, management, and administration. The initial number includes The Evaluation of Nesting Losses and Juvenile Mortality of the Ring-Necked Pheasant, by P. L. Errington and F. N. Hamerstrom, Jr. (pp. 3–20); Worm Parasites in Their Relations to Wildlife Investigations, by H. J. Van Cleave (pp. 21–27); Naturally Sustained Yield in a Farm Fur Crop in Mississippi, by L. E. Yeager (pp. 28–36); An Analysis of the Value of Refuges for Cyclic Game Species, by F. C. Edminster (pp. 37–41); and Use of Mechanical Brush-Cutters in Wildlife Management, by H. L. Stoddard (pp. 42–44).

Canadian Journal of Comparative Medicine is being issued in the interests of veterinary science at Gardenvale, Que., by an editorial board headed by Dr. T. W. M. Cameron of Macdonald College. Among the articles in the initial number are the following: The Endocrine Glands and Their Products—the Hormones, by J. B. Collip (pp. 9–15); The Practitioner's Rôle in Parasitology, by W. E. Swales (pp. 17–21); Tympany in Cattle, With Special Reference to Its Occurrence While Grazing on Alfalfa Pasturage, by R. A. McIntosh (pp. 23–25); and Pancreatitis of the Horse, by C. M. Higginson (pp. 27–36).

Beginning with February 1938, *Chronica Botanica* is being issued bimonthly instead of annually. Its aim will continue to be "promoting documentation, good will, and international cooperation among plant scientists." The contents will include brief preliminary notes on current discoveries, quotations, miscellaneous news items, book reviews, and similar material.

EXPERIMENT STATION RECORD

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THE EXPERIMENT STATIONS AND THE REPORT OF THE ADVISORY COMMITTEE ON EDUCATION

The Advisory Committee on Education was appointed by President Franklin D. Roosevelt in September 1936 to study the experience under the existing program of Federal aid for vocational education, the relation of such training to general education and to prevailing economic and social conditions, and the extent of the need for an expanded program. In April 1937, its scope was broadened by a request from the President for a more extended consideration of the whole subject of Federal relationships to State and local conduct of education. The report, submitted to Congress on February 23, 1938, and noted on page 880 of this issue, reviews the work of this Committee and embodies a number of specific recommendations. Most of its findings deal with the public schools and various aspects of vocational education, but the chapter devoted to higher education contains observations on the land-grant colleges and associated activities which should be of interest to many readers of the *Record*.

The Committee points out that the land-grant institutions were established in response to a demand for a type of education other than that provided by the classical type of institution which in 1862 offered virtually the only higher education available in America, and their development is deemed to have had a marked influence in bringing about the establishment of more serviceable institutions of higher education generally. "Their most important contribution, however, has been to the development of leadership for rural life. Much of the effectiveness of the land-grant colleges and universities has resulted from the fact that they have served as the centers around which to organize the federally aided services of agricultural research and extension."

"The agricultural experiment stations," the report declares, "occupy a unique and important place among the facilities of the Nation for organized research. They have provided research facilities for a basic industry in which the individual proprietors are almost universally unable to carry on extensive research through their own facilities. The diversified needs of a continental area have been met

by the geographic distribution of the experiment stations and by the maintenance of a high degree of local control over programs. On the other hand, the relationship of the agricultural experiment stations in the various States to the Department of Agriculture has facilitated national leadership and desirable coordination of effort. Wasteful duplication of research projects has been avoided to a much greater extent than would have been possible in the absence of the coordinating activities of the Department of Agriculture."

Aside from this general endorsement of the experiment stations, the Committee considers only two phases of their work. One of these relates to engineering and economics. Because of a study of research facilities already under way by another committee of the Federal Government, the Committee refrains from suggestions as to the establishment of Federal grants to the States for research in these fields, but it recommends that "if and when Federal aid is granted for research in such fields as engineering and economics, as has been proposed at various times, it should be given in such a way that it will not be confined to the land-grant colleges." It should be noted, however, that the Committee also states that "if Federal aid should be granted specifically for research and experimentation in agricultural engineering, as distinguished from other types of engineering, it would be appropriate and perhaps highly desirable to confine grants for agricultural engineering research and experimentation to the land-grant colleges in view of their special concern with the problems of agriculture."

The second relevant recommendation is that "attention be given to a more equitable division of the Federal grants for agricultural research and extension between services for the two races in those States maintaining separate schools and institutions for Negroes. The grants for resident instruction are now divided with reasonable equity because of the provisions of the Second Morrill Act of 1890, which required such a division in mandatory terms. No requirements for the division of the funds on a racial basis have been provided in the legislation relating to extension work or to agricultural research, and the evidence clearly indicates that Negro citizens do not receive services from these funds to the same extent as do white citizens. . . .

"The experiment station funds go exclusively to research in connection with the white institutions in those States maintaining separate land-grant colleges for Negroes. This does not imply that Negroes have not benefited by the results of the work done with the funds, since the published results have been available to all, and most of the agricultural, homemaking, economic, and rural sociological problems are common to both races. There are, however, many

social-economic adjustment problems that are considerably different for Negroes, in kind or degree, from those that confront white farmers and homemakers in the same areas. A large share of the experiment station funds are now available for 'such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life.' There is need for a great deal of research relative to these problems for Negroes. Yet not one of the studies reported by experiment stations in 1935, was directed toward the special aspects of these problems as they affect Negroes."

This portion of the report will doubtless receive considerable scrutiny, and it seems by no means certain of universal acceptance. The closing sentence in particular may meet with challenge as to its accuracy, unless it is intended to be interpreted as referring merely to station bulletins and similar publications constituting the formal report of completed investigations of exclusively Negro problems. Even on this basis it may indicate principally that the year 1935 was somewhat exceptional. Under date of September 1936, the Kentucky Station issued Part-Time Farming by Negroes Near Lexington, Kentucky, and there may be recalled the much earlier appearance of a bulletin from the Mississippi Station entitled A Nutrition Investigation of Negro Tenants in the Yazoo-Mississippi Delta (1928), as well as the series from the Virginia Station on The Negro Church in Rural Virginia (1930), Negro Organizations and Leadership in Relation to Rural Life in Virginia (1933), and Negro Life in Rural Virginia, 1865–1934 (1934). This list may appear short, but so also has been the list of all sociological projects. For instance, the records of the Office indicate that on June 30, 1937, there were only 46 Purnell projects in rural sociology in the entire 48 States, an average of less than 1 such project per station.

What is of much more significance, however, is that in the development of social-economic projects research workers have not usually isolated problems along racial lines. Most of the studies in States having a large percentage of Negroes have assumed that both whites and Negroes are an integral part of the population, and both races have been included in the studies. Each group contains landowners, tenants, croppers, and laborers, varying in economic and social status. Most of the studies based upon communities, population trends, family living, farm management, food habits, and social mobility have covered both races. Even though the States having the largest Negro population have been limited in State support for research and have had great pressure for service outside of the social field, there have been in the aggregate many such studies and

in them the races have been differentiated so far as has been deemed necessary. In 1935, for example, 6 of the Southern States were actively engaged in 11 projects taking up social and economic problems of white and Negro farm groups, and at least 1 of these projects was limited to studies with the Negro.

The Committee admits that "there is much to be said in favor of centralizing the responsibility for research in agriculture and home economics within a State," but maintains that there is no valid argument "for neglecting the problems peculiar to as large an element in the population as the Negro is in the rural population of the South." It therefore recommends that "cooperative arrangements between the land-grant institutions for whites and the corresponding institutions for Negroes should be developed wherever practicable, in order that the special problems of all rural people may receive attention through constructive, realistic, and well-coordinated research."

Aside from these and somewhat analogous reservations regarding extension funds as to the need, in any revision of the legislation, of careful consideration of the bases of allocations and matching requirements, the Committee expresses its approval of the existing status as follows: "The Committee believes that the Federal grants for instruction in the land-grant colleges and for the related activities of research and extension have been justified by their demonstrated contribution to agriculture and rural life. It recommends that the existing grants be continued, and that the increases now authorized by law be made."

Of the 23 members of the Committee, only the chairman and director of studies, Dr. Floyd W. Reeves, associated with the University of Kentucky from 1925 to 1929; the vice chairman, Dr. George F. Zook, formerly of the United States Office of Education; Dr. Henry C. Taylor, pioneer among agricultural economists; Dr. Mordecai Ezekiel, of the United States Department of Agriculture; and Miss Alice Edwards, well-known among home economics workers, seem to have had extensive previous contacts with the land-grant college system. The Committee endorsement is therefore significant as representing the matured convictions of a group of investigators selected primarily with reference to other phases of educational work, but who reveal themselves in this report as sympathetic and appreciative of what the land-grant institutions are attempting to accomplish for the betterment of American life.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Investigations in bacteriological chemistry by the Wisconsin Station] (*Wisconsin Sta. Bul. 439 (1937), pp. 55, 56, 59, 60*).—The use of wood sugar liquor (of which the sugar content with soft woods is about 70 percent fermentable) for acetone and butyl alcohol production (from 20 to 35 percent of the total sugars) by bacterial fermentation is reported by W. H. Peterson, E. B. Fred, A. F. Langlykke, and N. O. Sjolander. The possibility of using the wood sugar liquor as a legume silage preservative is also mentioned. F. R. Olson, Peterson, and Fred note a study of the reduction of the lignin content of wood, which must be less than 1 percent to permit a 90 percent fermentation of the cellulose by thermophiles. D. Colingsworth, E. C. Saudek, and I. L. Baldwin report upon the improvement of yeast yields by using grain worts of a high α-amino nitrogen content and by feeding the concentrated worts to the yeast gradually instead of all at once. Studies of *Cl[ostridium] thermosaccharolyticum*, which causes hard swell spoilage in canned foods, carried on by Sjolander and E. McCoy, are noted.

Oxidation of amino acids by *Bacillus pyocyaneus* (*Pseudomonas aeruginosa*), M. D. Webster and F. Bernheim (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 265–271, fig. 1*).—Tryptophan and methionine were not attacked. There were large variations in the oxidation rates and the extent to which the other amino acids were oxidized. The bacteria oxidized and deaminated only the natural isomers of leucine, isoleucine, and histidine but both isomers of alanine, serine, tyrosine, and proline. The nonnatural isomers of valine and phenylalanine were slightly attacked.

The oxidation and deamination of both isomers were completely inhibited by 0.005 M KCN but were unaffected by 1 percent sodium fluoride or 1 percent urethan. Methylene blue was reduced by all the amino acids, but no differences in relative rates occurred. Neither this dye nor pyocyanine, added to the bacteria, affected the oxidation.

Methods for the detection of lipolysis by microorganisms, H. F. Long and B. W. Hammer (*Iowa State Col. Jour. Sci., 11 (1937), No. 4, pp. 343–351, fig. 1*).—A comparison of various tests for the detection of lipolytic action by microorganisms gave evidence that the natural fat, the nile blue sulfate, the modified nile blue sulfate, and the simple triglyceride technics are the most useful. The chief objection to the use of the natural fat technic is the difficulty of detecting weakly lipolytic organisms. The use of the nile blue sulfate test in which the dye is added to the medium is limited because of the toxicity of the dye. The modified nile blue test in which incubated plates are flooded with a solution of the dye has proved very valuable. Difficulty in the picking of colonies after flooding is the chief objection to this method. A positive test with simple triglycerides, which are easily hydrolyzed, is not always an indication of the ability of organisms to hydrolyze natural fats.

The extraction of blood lipids, E. M. Boyd (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 223–234, figs. 2*).—It was found that when alcohol-ether extracts of blood are sufficiently diluted, lipides are rapidly and completely extracted.

Heat or prolonged periods of cold extraction do not increase the yield of lipides. An hour's boiling does not destroy extracted lipides but causes the solution of colored products from whole blood, which results in giving false high values, especially for neutral fat. Lipides are extracted equally well by proportions of alcohol and ether varying over an extensive range. Very small amounts of lipides are more difficult to extract. Too small aliquots of serum give low values for phospholipide and high values for cholesterol. Defibrinated plasma contains more of all lipides than oxalated plasma.

Note on the preparation of sinigrin, S. MORELL and K. P. LINK (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 123, 124*).—The authors of this contribution from the Wisconsin Experiment Station have compared methods for the preparation of the sulfur-containing glucoside of black mustard (*Brassica nigra*), and conclude that satisfactory results can be obtained only by the use of methods involving the removal of sugars, especially sucrose, by fermentation with yeast.

Isolation of crystalline tobacco mosaic virus protein from tomato plants, H. S. LORING and W. M. STANLEY (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 733–754, fig. 1*).—The isolation from tobacco-mosaic-diseased tomato plants of a crystalline protein possessing the properties of tobacco-mosaic virus is described. The most active crystalline material could be best obtained from young rapidly growing greenhouse plants by a procedure involving a minimum of treatment with celite.

The properties of the proteins obtained from tomato and tobacco plants grown under the same conditions and treated by the same procedure were compared. The proteins were shown to possess the same infectivities and to have identical serological properties and very nearly the same solubilities. They likewise had the same chemical composition, optical activity, and isoelectric point, and gave the same sedimentation constant. Repeated fractionation of the virus protein with celite at pH 4.5 and 8.0 resulted in a gradual inactivation of the protein, which remains soluble and may still be crystallized. In other fractionation experiments, however, as much as 81 percent of the original sample was lost during the course of 15 recrystallizations, and the crystals which remained possessed the same infectivity as the original sample.

"The comparison of the relative infectivities of the juices of diseased tomato and tobacco plants on a total protein basis indicates, in agreement with the percentage yields of crystalline virus protein isolated, that the tobacco-mosaic virus reaches a higher concentration in tobacco than in tomato plants."

Thyroglobulin studies.—II, The Van Slyke nitrogen distribution and tyrosine and tryptophane analyses for normal and goitrous human thyroglobulin, J. W. CAVETT (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 65–73*).—From a further study of the thyroglobulin samples formerly used (E. S. R., 75, p. 148), it appears, from an investigation carried out at the University of Minnesota, that the amino acid content of the thyroglobulin molecule, with the exception of thyroxine, diiodotyrosine, and tyrosine, is the same whether it be obtained from a normal, colloid, adenomatous, or exophthalmic gland.

"The data seems to indicate that the tyrosine which is present at certain points in the thyroglobulin molecule is capable of conversion into diiodotyrosine or thyroxine. It appears that in the goitrous gland this formation, especially of the thyroxine, is interfered with. The thyroglobulin from colloid glands where no iodine medication had been used is very deficient in the iodine-containing amino acids, and the tyrosine content is proportionately greater. The adenomatous and exophthalmic glands, where iodine medication had been used, yielded thyroglobulin which contained varying amounts of the iodine-

containing amino acids. The tyrosine content varied inversely with the amount of the iodine-containing amino acids."

The denaturation of proteins by sound waves of audible frequencies, L. A. Chambers and E. W. Flosdorf (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 75–83, fig. 1*).—This investigation has shown that egg albumin and plastein are denatured by intense sonic vibration. The solubility of the products under various conditions of pH is the same as that of the heat-denatured products. Horse serum albumin is not denatured by sonic vibration.

A possible mechanism of sonic denaturation is discussed. The hypothesis requires direct transfer of energy from activated gas to protein molecules without chemical interaction.

The influence of intense mechanical vibration on the proteolytic activity of pepsin, L. A. Chambers (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 639–649, figs. 4*).—In this investigation a thrice recrystallized pepsin in acid solution (pH 1.8) was shown to be inactivated by exposure to intense sound waves of 9,000 cycle frequency.

"The relation between time of exposure and peptic activity may be expressed by the general law $A=A_0e^{-kt}$ where A represents the activity remaining at time t, A_0 being the initial activity. The inactivation reaction occurs in the presence of O_2 or air, but not in pure N_2 or H_2, or in deaerated solutions. Furthermore, the reaction is inhibited by pressures sufficient to prevent cavitation even when O_2 is present.

"Certain, though not all, unpurified pepsin preparations show a more or less marked increase in proteolytic activity during the first 3 min. of exposure to sound. This activation process occurs under all conditions, allowing free cavitation in the solution. In air, inactivation sets in after a maximum activity value has been reached. On the other hand the substitution of N_2 or H_2 (gases which do not promote protein denaturation) results in the attainment of a greater maximum activity, following which there is no further change. The increased activity is tentatively attributed to increased availability of the enzyme caused by sonic dispersal of molecular aggregates."

Does trypsin inactivate urease? J. B. Sumner and A. L. Dounce (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 713–717, figs. 3*).—In this contribution from Cornell University the authors show that urease preserved with sulfite ("an approximately neutral mixture of sulfite and bisulfite") was not measurably inactivated by trypsin at room temperature over a period of 95 hr. The sulfite exerted a remarkable preservative action upon the urease.

"The urease loses its activity at nearly the same rate whether in the presence of gum arabic and active trypsin . . ., in the presence of active trypsin alone . . ., or in the presence of gum arabic and boiled trypsin. . . . It is quite certain that gum arabic exerts no influence upon the rate of inactivation of urease by trypsin."

On the nature of the reaction between diazotized sulfanilic acid and proteins, H. Eagle and P. Vickers (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 193–197; abs. in Chem. Abs., 30 (1936), No. 14, p. 4883*).—Several groups in protein other than the histidine and the tyrosine were found capable of reacting with diazosulfanilic acid. "Numerically by far the most important, exceeding in fact the two groups just cited, is the aliphatic NH_2 group. . . . Each NH_2 group inactivated approximately 2 molecules of the diazo compound."

The accelerant effect of α-amino acids on the activity of bone phosphatase, O. Bodansky (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 273–288*).—The author has shown that α-amino acids in low concentrations, from 0.0001 M to 0.01 M, accelerate the action of bone phosphatase.

"The extent of the acceleration is a function of the concentration of α-amino acid. At optimal concentrations, the extent is the same for different amino acids. The zone of optimal acceleration varies with the individual acid. At concentrations greater than optimal, the α-amino acids exert a retardant effect. Other organic nitrogen compounds, not possessing the α-aminocarboxy linkage, do not accelerate hydrolysis."

The manner of acceleration by α-amino acids is considered to be a prevention of the inactivation of the bone phosphatase which occurs during the course of the hydrolysis.

The organic acids of rhubarb (Rheum hybridum), I, II, G. W. PUCHER, H. E. CLARK, and H. B. VICKERY (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 599–604; 605–617*).—The two papers here noted open a serial contribution from the Connecticut [New Haven] Experiment Station.

I. *On the malic acid of rhubarb, with a note on the malic acid of tobacco leaves.*—An examination of the malic acid in the rhizomes, buds, petioles, and leaf blades of the rhubarb plant at several stages in its development has shown that only the levorotatory isomer of this acid is present. It is concluded that methods, the use of which has led to the belief that the racemic form of this acid was also present, provide for "no sharp distinction between *dl*-malic acid and other inactive acids," a view which was supported by the further observation that the malic acid content of tobacco leaves is also exclusively levorotatory.

II. *The organic acid composition of the leaves.*—"The rhubarb leaf contains *l*-malic, oxalic, and citric acids together with acids of unknown nature. The composition differs in different parts of the leaf and is profoundly influenced by the age of the leaf and by the season in which it has developed. The group of unknown acids predominates in the blades of the younger leaves, oxalic acid being present in next smaller amount. In the blades of leaves developed late in the season, oxalic acid predominates over the unknown acids. *l*-Malic and citric acids are present in small amounts in the blades. The predominating acid of the main veins is *l*-malic with oxalic in second place. Citric acid and the unknown acids occupy minor positions. The predominating acid of the petiole is *l*-malic with oxalic in second place. Citric and the unknown acids are present in small amounts.

"The concentration data show that oxalic, citric, and the unknown acids occur in a concentration gradient that increases from petiole to vein to blade. *l*-Malic acid, on the other hand, is present in a concentration gradient that decreases from petiole to vein to blade. As a result, the concentration of the total organic acids is not far from constant in all parts of the leaf. There is only a slight gradient of the total organic acidity which increases from petiole to blade. It is shown that this conclusion is not at variance with the results of direct titration of extracts of the tissues. . . .

"Determinations of the ammonia in the tissues showed that the concentration is in all cases quite low, and that there is no correlation whatever with the concentration of any individual acid nor with the total acidity."

The fatty acids of chrysalis oil, W. BERGMANN (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 27–38*).—The commercial oil contained considerable quantities of a solid material which was identified as glyceryl-1,3-dipalmitate. The mixture of fatty acids obtained from chrysalis oil consisted of 20 percent palmitic, 4 stearic, 2 palmitoleic, 35 oleic, 12 linoleic, and 28 percent linolenic acid, besides less than 1 percent of saturated and from 1 to 2 percent of unsaturated acids containing more than 18 carbon atoms.

The composition of the chrysalis oil of the eastern tent caterpillar (*Malacosoma americana*) was very similar to that of the silkworm (*Bombyx mori*).

The iron content and oxygen capacity of blood, M. JOHNSON and M. E. HANKE (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 157–170*).—An iodometric method for the accurate determination of iron in blood, by which the iron content may be determined to 0.1 mM of iron per liter, has been developed.

"(1) Care must be taken to insure complete oxidation of the blood. (2) For the $Na_2S_2O_3$ titration, sulfates and phosphates must be removed, the acidity must not be too great, and the acidity and salt concentration must be accurately controlled. This is accomplished by precipitating the iron as $Fe(OH)_3$, washing until salts are completely removed, redissolving the iron in a measured excess of HCl, and partially neutralizing the acid with a measured amount of NaOH. (3) The factor on the $Na_2S_2O_3$ must be determined by titration against standard $FeCl_3$, the same conditions of salt and acid concentrations as in the unknowns being used. No other standard may be used because the factor on the $Na_2S_2O_3$ varies with the amount of iron. (4) The end point must be determined in exactly the same way in all samples, standard and unknown, with respect to the time intervals allowed and the amounts of KI used. A preliminary end point is reached in the presence of starch, and after standing 5 min. the final end point is attained."

The iron content and O_2 capacity of blood were found to agree within 1 percent.

Some chemical constituents of flowering dogwood (Cornus florida), C. E. SANDO, K. S. MARKLEY, and M. B. MATLACK (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 39–45*).—At the U. S. D. A. Bureau of Chemistry and Soils the following substances, in addition to inositol, $C_6H_{12}O_6$, and scyllitol, $C_6H_{12}O_6$, have been identified from the flowers and bracts of dogwood (*C. florida*): A mixture of hydrocarbons in which nonacosane, $C_{29}H_{60}$, predominates; a phytosterol, $C_{26}H_{43}OH$; palmitic, $C_{16}H_{32}O_2$, stearic, $C_{18}H_{36}O_2$, linolenic, $C_{18}H_{30}O_2$, and oleic acids, $C_{18}H_{34}O_2$; ursolic acid, $HO{\cdot}C_{29}H_{46}{\cdot}COOH$; kaempferol, $C_{15}H_6O_2(OH)_4$; gallic acid, $C_6H_2(OH)_3COOH$; and quercetin, $C_{15}H_5O_2(OH)_5$.

A capillary, non-penetrating microquinhydrone electrode, J. A. PIERCE (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 651–654, fig. 1*).—A microelectrode has been devised by means of which a sample of less than 0.2 mm³ can be examined rapidly and with accuracy to from 0.01 to 0.02 pH unit.

A method for determining the solubility of gases in pure liquids or solutions by the Van Slyke-Neill manometric apparatus, F. S. ORCUTT and M. H. SEEVERS (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 501–507*).—The authors have devised, at the University of Wisconsin, a modification of the Van Slyke-Neill method (E. S. R., 69, p. 172) for the quantitative estimation of gases in liquids to adapt the method for determining the solubility of gases in liquids. The principal addition to the former method is that the volume of gas which remains unextracted is corrected for by the technic and method of calculation presented. "This makes it possible to determine the solubility of any gas in any liquid or solution without the necessity of resorting to the literature for constants."

A method for the determination of cyclopropane, ethylene, and nitrous oxide in blood with the Van Slyke-Neill manometric apparatus, F. S. ORCUTT and R. M. WATERS (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 509–515*).—Basing their proposed procedure on their method for gas solubilities above noted, the authors have compiled and tabulated suitable factors for each gas by which the observed partial pressure may be converted to concentration in the blood. Corrections have been made for unextracted portions of the gases in the solutions from which they are extracted by direct solubility measurements in these solutions.

The colorimetric determination of free and combined cholesterol, R. M. Smith and A. Marble (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 673–684*).—A colorimetric method for free cholesterol, based upon an analysis of the digitonide precipitate, is outlined. Evidence presented indicates that the factor responsible for the higher total cholesterol values usually obtained on unsaponified blood filtrates is associated with the ester fraction.

Non-sugar reducing substances in plant juices, F. S. Schlenker (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 727–731*).—In this contribution from the Rhode Island Experiment Station the author shows that differing results given by two sugar methods used for analysis of expressed plant juice are due to the sensitivity of the oxidizing solutions in reactions with nonfermentable substances.

"The more sensitive ferricyanide reagent gives higher values for both the nonfermentable fraction and total reduction than does the alkaline copper tartrate solution. The two methods yield the same values for fermentable sugar, calculated as the difference between reducing values determined before and after yeast treatment. Alcoholic extracts of tomato, chrysanthemum, bean, and beet likewise show the presence of nonfermentable substances which account for a third to a half of the total reduction under the growth conditions studied."

A reagent for the copper-iodometric determination of very small amounts of sugar, M. Somogyi (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 771–776*).—The author describes a reagent for the copper-iodometric determination of sugars, "in which the reoxidation of cuprous oxide by air is virtually eliminated. As a consequence, first, very small quantities of sugars (as little as 0.01 mg of glucose) can be determined accurately by the copper-iodometric technic, and, second, a linear proportionality between the amounts of the sugars and the copper reduced is established. Thus, the advantages of ferricyanide reagents have been imparted to copper reagents, without the tendency of the former to oxidize extensively substances other than sugar."

A comparison between the Benedict-Denis and Parr bomb methods for the determination of total sulfur in plants and proteins, E. P. Painter and K. W. Franke (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 235–239*).—At the South Dakota Experiment Station total sulfur has been determined by the Benedict-Denis [1] and Parr bomb methods on a number of cereals and proteins. The Parr bomb method gave higher values with both the cereal and protein samples. Three cystine and three methionine samples were compared by these and the Official sodium peroxide fusion method. An average of 96.5 percent of the cystine sulfur was recovered by the Benedict-Denis method, but only 36.8 percent of the methionine sulfur was recovered. The results of the peroxide fusion method agreed well with those of the Parr bomb method.

A colorimetric method for the determination of inorganic sulfate in serum and urine, T. V. Letonoff and J. G. Reinhold (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 147–156; abs. in Chem. Abs., 30 (1936), No. 14, pp. 4891, 4892*).—A convenient colorimetric procedure for the determination of sulfate in serum and urine, based on the color-producing reaction between benzidine sulfate and sodium β-naphthoquinone-4-sulfonate, is described.

Quantitative determination of copper and estimation of other trace elements by spectrographic methods in wire grasses from "salt sick" and healthy areas, L. L. Rusoff, L. H. Rogers, and L. W. Gaddum (*Jour. Agr. Res. [U. S.], 55 (1937), No. 10, pp. 731–738*).—The Florida Experiment Station collected samples of wire grass from areas on which cattle became salt sick and from healthy areas from both burned and unburned ranges, the healthy burned

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[1] Jour. Biol. Chem., 8 (1910), No. 5, pp. 401–403.

area being designated as marginal. Spectrographic determinations of the copper content of samples from these areas failed to disclose any significant differences, those from the salt-sick area ranging from 6.2 to 8 p. p. m. and those from the healthy area from 6.8 to 8 p. p. m. of copper. The copper content of such vegetation is apparently not proportional to that in the soil (E. S. R., 73, p. 16). Spectrographic estimation of other trace elements in these samples also failed to show significant differences. Aluminum, barium, boron, copper, lead, manganese, strontium, titanium, and zinc were detected in all samples. Chromium, molybdenum, silver, and nickel were detected in the samples but not consistently, while cobalt and certain other elements were not detected in any of the samples.

A note on the determination of iodine in biological material, G. J. Fashena and V. Trevorrow (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 351–355*).—The authors of this contribution from Cornell University and the New York Hospital have found it necessary to modify their method (E. S. R., 74, p. 444) because the recovery of iodine was not in all cases satisfactory. The difficulty was traced to slow reduction of the iodic acid by phosphorous acid, but "it was finally found that the addition of more water to the digestion mixture before distillation hastened the reduction of iodic acid and that the liberated iodine could be distilled rapidly from such a boiling mixture by means of a current of air." Other changes permitted shortening the time required for carrying out the determination.

Methylene-blue induction period and virginity of olive oils, B. B. Cunningham and L. G. Saywell (*Food Res., 1 (1936), No. 5, pp. 457–464, fig. 1*).—It has been shown, at the University of California, that "the natural antioxidant content of a nontreated oil, although markedly affected by most refining treatments, varies so widely that it cannot be used as a basis of a test for virginity. It does not appear likely that a substance such as virgin olive oil, defined upon a basis of its manner of preparation rather than its physical or chemical properties, can be uniquely and quantitatively estimated by any physical or chemical test."

Studying the hardness of butter fat, W. D. Gallup (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 2, pp. 123, 124, fig. 1*).—After constructing and testing a number of apparatus involving measurement of penetration of needles or plungers, the author of this contribution from the Oklahoma Experiment Station found the most satisfactory device to be one by means of which hardness is expressed as grams of mercury required to force a plunger 5 mm in diameter through a disk of butterfat 6 mm in thickness at 20° C. The construction and manipulation of this tester are described.

A new method for the determination of butterfat in dairy products, J. Golding (*Jour. Dairy Res. [London], 8 (1937), No. 3, pp. 275–281, figs. 2*).—The method described briefly consists of weighing 10 g of the product to be tested (cream, milk, or ice cream mix) into a small wide-mouthed bottle, adding a suitable amount of a reagent composed of ammonium hydroxide, *n*-butyl alcohol, and ethyl alcohol 75:35:15, stoppering the bottle and shaking until butter is formed, filling the bottle with cold water, removing the butter into a tared weighing dish, drying on a hot plate or in the oven until all moisture is driven off, weighing, and calculating the percentage of fat. This method gave results in close agreement with those obtained by the Roese-Gottlieb method and is considered very adaptable to the routine fat analysis of the various dairy products.

Determination of aneurin (= vitamin B_1) in urine by the thiochrome method, J. Goudsmit and H. G. K. Westenbrink (*Nature [London], 139 (1937), No. 3530, pp. 1108, 1109*).—The authors applied the Jansen method (E. S. R.,

77, p. 298) of determining aneurin to the estimation of the quantity of the vitamin in the urine of three normal subjects receiving a vitamin B_1-free diet composed of washed polished rice, crackers, egg white, butter, and sugar before and after the administration of 1 mg of aneurin three times a day. The results obtained are in close agreement with those reported by Harris and Leong (E. S. R., 76, p. 427) by the bradycardia method.

On ascorbic acid- (vitamin C-) oxidase (a method for the determination of ascorbic acid by means of enzyme action), J. P. Spruyt and W. F. Donath (*Arch. Néerland. Physiol. Homme et Anim., 22 (1937), No. 3, pp. 382–397*).—The method described involves the use of an enzyme present in the juice of the pods of *Moringa pterygosperma*, a tree of common occurrence in Java. In amounts of 0.5 cc the enzyme, the preparation of which is described, is said to be capable of completely (reversibly) oxidizing 2 mg of ascorbic acid within 5 min. Its use is thought to be of special value in determining the ascorbic acid content of plant material.

As applied to fruit, the juice of the material to be tested or an extract prepared with 10 percent acetic acid at room temperature is immediately treated with hydrogen sulfide and left overnight in the refrigerator. After the removal of excess hydrogen sulfide and the addition of concentrated acetic acid, one portion of the material is used for the regular titration with 2,6-dichlorophenolindophenol. To another portion the enzyme is added and the solution is adjusted to a pH of about 5.5, and after about 10 min. at room temperature is acidified with concentrated acetic acid and titrated in the usual way. The difference between the values obtained with and without enzyme action represents the ascorbic acid content.

Illustrations are given of the application of the method to fruits of medium, low, and high vitamin C content. Two samples of orange juice gave final values of 0.45 and 0.53 mg of ascorbic acid per cubic centimeter, two of tamarind pulp 0.22 and 0.24 mg per gram, and two of capsicum pulp 2.35 and 2.12 mg per gram.

[Fruit preservation studies by the Oregon Station] (*Oregon Sta. Bul. 350 (1937), pp. 31, 35*).—This work has included brining of cherries and a study of factors which influence the quality of strawberry preserves.

Factors affecting the rate of drying of Kieffer pears, C. W. Culpepper and H. H. Moon (*U. S. Dept. Agr., Tech. Bul. 592 (1937), pp. 31, figs. 16*).—Using fruit grown at Beltsville, Md., the authors made a study of the factors affecting the rate of drying of Kieffer pears. Increasing the rate of drying improved the quality of the product somewhat, while increasing the drying temperature lowered the quality. With respect to the quality of the product, the optimum drying temperature was found to be approximately 60° C. The rate of change in moisture content and the rate of water loss at all stages in the drying process were determined for fruit sliced into various sized segments. The differences in the rate of drying of ripened and unripened, of peeled, and of unpeeled fruit were also determined, together with the effect of humidity, temperature, and velocity of the drying air. The results are shown in tables and curves. The drying rate was apparently limited, in part, by the slowness of diffusion of the moisture from the center of the pieces of fruit to the surface.

The relation of clarifying and sterilizing treatments to sedimentation of apple juice, R. E. Marshall (*Fruit Prod. Jour. and Amer. Vinegar Indus., 16 (1937), No. 11, pp. 328, 329, 331, fig. 1; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 2, p. 116*).—Various modifications of a combination of enzymic (Pectinol A) clarification of fresh apple juice followed by rough filtration and then by germproofing filtration resulted in the deposition of an amorphous dark-brown sediment or precipitate in from 3 to 5 weeks when stored at 70° F.

or after a few months' storage at from 32° to 35°. It is recommended that those desiring to use the germproofing filtration method of sterilizing apple juice should clarify the cider with gelatin and tannin rather than with Pectinol. Pectinol-clarified juice which had been rough-filtered could be flash-pasteurized or pasteurized in the bottle without sedimentation.

AGRICULTURAL METEOROLOGY

Bioclimatics: A science of life and climate relations, A. D. Hopkins (*U. S. Dept. Agr., Misc. Pub. 280 (1938), pp. IV+188, figs. 55*).—As stated in the introduction, "the purpose of this publication is to give the results of long-continued studies and researches on natural laws and principles of life and climate relations and on systems and methods of their application in agricultural research and practice, with the hope that specialists in different sciences will adopt such of them as may be found applicable in their several lines of work. The subjects treated are restricted largely to the bioclimatic law and allied principles, but at the same time are more or less related to some phase of all the natural sciences." The publication is divided into three parts—(1) laws, principles, systems, and methods of application; (2) time, seasons, zones, and zonal types; and (3) an appendix giving general explanations, schedules, tables, glossary of symbols, and definitions.

As a result of his studies, the author has evolved a bioclimatic law which he explains as follows: "The bioclimatic law requires that across the continents under equal physiographic conditions the phenomena of the seasons, climate, and life should be equal at the same level along lines designated as isophanes, which depart from the parallels of latitude at the rate of 1° of latitude to 5° of longitude; and that, with distance in degrees of latitude poleward and equatorward from such a line, or in feet of altitude above or below a given level, the required effects should vary at a uniform, constant rate, as measured in units of time or temperature.

"Tests of this law by recorded thermal data of representative geographic positions, along representative isophanes and parallels of latitude across the continents of the Northern and Southern Hemispheres, have shown in general (a) that the range in variations is less from the isophane than from the latitude requirements, (b) that the variations come within a reasonable range, and (c) that under ordinary modifying influences the average of the variations across a continent closely agrees with the requirement isophane, and thus serves to verify the law and to justify its adoption as a standard basis for the application of principles in the interpretation of bioclimatic phenomena."

An especially significant section of the report is that dealing with relations of bioclimatics to other sciences—phenology, ecology, climatology, economic biology, and agriculture. With regard to applications to agriculture the author says: "Throughout this contribution it has been fully explained and verified by concrete examples that the special service to be rendered through an understanding and general application of bioclimatic principles and methods of procedure is to contribute to the efficiency of securing essential basic information on the places, local areas, and regions in this and other countries where given types of farming and types of products have succeeded best and where they have failed, and then to aid in finding by the same process of analyses the places in this country where the same favorable or unfavorable conditions prevail."

An introduction to weather and climate, G. T. Trewartha (*New York and London: McGraw-Hill Book Co., 1937, pp. IX+373, pls. 7, figs. 108*).—This is one of a series of texts in geography. The reason for its publication as a

separate volume is stated to be "the need expressed by geographers for a brief introductory text at college level covering the field of weather and climate apart from the other elements of physical earth. . . . It makes no pretense of being a textbook on meteorology or air physics." Part 1 deals with the elements of weather and climate and part 2 with climatic types and their distribution. Appendixes give an explanation of Köppen's and Thornthwaite's classifications of climates and supplementary climatic data for selected stations. The value of the book is enhanced by lists of selected references and an index.

Textbook of meteorology, edited by R. Süring (*Lehrbuch der Meteorologie. Leipzig: Willibald Keller, 1937, 5. ed., rev., pts. 1, pp. 96, figs. 16; 2, pp. 97–192, figs. 18; abs. in Met. Ztschr. [Braunschweig], 54 (1937), No. 11, pp. 428, 429*).—A fifth, completely revised, edition of this well-known treatise (E. S. R., 34, p. 13).

Meteorological observations, [1937], C. I. Gunness et al. (*Massachusetts Sta. Met. Ser. Buls. 577–588 (1937), pp. 4 each*).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1937, which shows that the mean pressure for the year was 30.02 in.; the mean temperature 49° F., as compared with the normal of 47.2°, highest 96° July 8, lowest 6° February 4 and December 31; total precipitation 49.49 in., as compared with the normal of 43.49 in.; snowfall 25.5 in., as compared with the normal of 48.38 in.; mean cloudiness 52.2 percent, bright sunshine 52 percent; last frost in spring April 26, first in fall October 9; last snow April 9, first November 19.

Chinook winds in northern Colorado, R. L. Ives (*Amer. Jour. Sci., 5. ser., 35 (1938), No. 206, pp. 138–142, fig. 1*).—The author states that "chinook winds have long been known as a feature of the climate of the Rocky Mountain Region. Recently observed temperatures in the mountains during chinook winds differ considerably from those called for by the generally accepted explanation of these winds. These temperature differences, and their relation to evaporation and wind velocity, are described in [the] paper. A partial explanation of the difference between theoretical and observed temperatures is presented. . . . It appears that neither the dry nor the wet adiabatic theories give an entirely satisfactory explanation of temperature changes during a chinook wind. . . . The wind from the mountains is cold during the early stages of a chinook because of the heat lost by the lower layers of moving air as the unsheltered snow on the leeward slopes is sublimated. Later, when this snow is gone, the wind becomes warm, for little of the heat gained by the air during its desiccation on the windward slope is withdrawn during the descent of the leeward slope."

Agricultural meteorology: Correlation of air temperatures in central and southern Alberta and Saskatchewan with latitude, longitude and altitude, J. W. Hopkins (*Canad. Jour. Res., 16 (1938), No. 1, Sect. C, pp. 16–26, figs. 2*).—"Linear partial regression coefficients of the 18-yr. average (1917–34) monthly mean air temperature recorded at 43 points in central and southern Alberta and Saskatchewan on latitude, longitude, and altitude were determined for each month of the year. The three series of coefficients each show an independent seasonal trend. The decrease in air temperature with altitude is greatest in summer and least in winter, whereas the gradient associated with longitude is most pronounced in winter and least in evidence in summer. The influence of latitude is likewise most pronounced in winter, but shows 2 minima, in spring and autumn, respectively. The monthly regression equations account for most of

the variance of the station averages, and hence provide a reasonably satisfactory graduation of the climatological temperature gradients characteristic of this area at different seasons of the year."

SOILS—FERTILIZERS

[Soils and fertilizers, Alabama Station, 1934–35 and 1936] (*Alabama Sta. Rpts. 1934–35, pp. 14, 15; 1936, pp. 10, 11, 12, 13, 14*).—Aside from findings already published (E. S. R., 78, p. 165), the soil work noted for 1934–35 consists of a study of the relationship between nitrite and formaldehyde concentration within the algal cell, by A. L. Sommer. That for 1936 deals with the solubilities of phosphates in soils as related to the yields of cotton, and the action of calcium silicate in soils as related to the availability of phosphates, both by G. D. Scarseth; meta- and pyrophosphate within the algal cell, by Sommer; and the effect of lime on the efficiency of various fertilizers on Cecil clay as determined by yields and composition of plants, and the effect of lime on the competition of micro-organisms and higher plants, both by J. A. Naftel.

Commercial fertilizers, 1937, E. R. Tobey (*Maine Sta. Off. Insp. 165 (1937), pp. 57–108*).—The annual fertilizer analysis report (E. S. R., 76, p. 600) for 1937 contains the usual data for materials and mixtures, including the magnesium content when a guaranty was made.

Soils of Judith Basin County: Soil reconnoissance of Montana.—Preliminary report, L. F. Gieseker (*Montana Sta. Bul. 349 (1937), pp. 55, fig. 1, maps 4*).—This is a reconnaissance survey report on a county occupying 1,894 sq. miles of a high tableland area in central Montana. The county is drained by the Judith River and its branches and by Arrow and Belt Creeks and other streams.

The soils of Judith Basin County are grouped in 18 soil series and 51 soil types and phases. The teton stony loams, totaling 14.2 percent, and the Moccasin gravelly silt loams, 9 percent, are the more extensive soils. Mountains occupy 27.5 percent of the area included in the county.

Inspection of commercial fertilizers for 1937, T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 301 (1937), pp. 11*).—In the annual fertilizer inspection analyses for 1937, 27 of the 76 brands sold were found to be of one of the three analyses 5–8–7, 4–8–4, and 4–8–10.

Adapting standard and high analysis fertilizers to truck crop soils, J. J. Skinner, R. A. Lineberry, H. B. Mann, and E. R. Collins (*North Carolina Sta. Bul. 316 (1937), pp. 24*).—Experiments carried out by the U. S. D. A. Bureau of Plant Industry in cooperation with the station "indicate that the use of soluble nitrogen and properly supplemented double strength fertilizers should give good results and reduce the cost of crop production. Fertilizer applied in one operation, simultaneous with planting (a desirable practice on some soils), results in saving of labor. Best results have been secured with cotton on sandy loams, fine sandy loams, and clay loams when all the fertilizer was applied at planting to the side of the seed. On sandy soil types and coarse sands, from which fertilizers are readily leached, application of part of the nitrogen as a side dressing is preferable."

[Soil investigations by the Oregon Station] (*Oregon Sta. Bul. 350 (1937), pp. 32, 33, 38, 39, 53*).—Brief notes are presented on the improvement of alkaline lands, organic matter and availability of mineral nutrients in soils, iodine in plant nutrition, the microbial decomposition of organic matter in certain Oregon soils, and soil fertility studies at the station and the John Jacob Astor Substation, Astoria.

Chemical and physical studies of certain Hawaiian soil profiles, G. J. HOUGH and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 584 (1937), pp. 27, figs. 8*).—The mechanical analyses, chemical analyses, and analyses of the colloids of seven soil profiles from Hawaii are reported upon, together with the molecular ratios of silica to sesquioxides, alumina, and other components characterizing soil colloids. Extensive differences between the colloids in soil developed from lava under semitropical conditions and those of soils developed under the conditions normally present in the United States are shown.

"Some of the soils of Hawaii are apparently similar in chemical composition to certain lateritic soils in the continental United States which have silica: sesquioxide ratios of about 1.5. In other cases the soils appear to be true ferruginous Laterites and have silica: sesquioxide ratios far below unity and silica: alumina ratios approximating unity. Both the Laterites and lateritic soils are characterized by decreased silica content of the whole soil as compared with presumably parent lava, and the colloids by higher silica content than the soils. High titanium content is shown by both soils and colloids."

Report of the Chief of the Soil Conservation Service, 1937, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1937, pp. 51*).—This report deals with the operations and research activities of the Soil Conservation Service.

It is pointed out that in 18 States legislative action authorizing the formation of soil conservation districts opened for the first time an avenue through which individual and governmental initiative can be exerted in extending soil conservation practices to agricultural land. Thirteen soil erosion experiment stations were in operation during the year and 6 additional stations were being developed.

Progress results are reported on studies of watersheds, geography and climate, sedimentation, cropland, range, woodland, and wildlife management, hill culture, and the economics of soil conservation.

Soil survey of Pittsburg County, Oklahoma, M. H. LAYTON ET AL. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 29, pp. 28, pl. 1, figs. 2, map 1*).—Pittsburg County, southeastern Oklahoma, has an area of 876,800 acres, comprising stony ridges with smoothly rolling or undulating valleys intervening. The county as a whole has a good drainage system.

The soils found in the survey here noted constitute 12 series of 18 types, Bates very find sandy loam occupying 12.2 percent of the area. The rough stony land amounts to 44.8 percent.

This report, to which has been added a brief section on recommendations for the management of the soils, was prepared with the cooperation of the Oklahoma Experiment Station.

[Report of] subcommittee on fertilizer reaction, O. SCHREINER (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, p. 1050*).—This subcommittee report is a contribution from the U. S. D. A. Bureau of Plant Industry.

[Report of] subcommittee on fertilizer grades, C. E. MILLAR (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, pp. 1049, 1050*).—A subcommittee report contributed from the Michigan Experiment Station presents the opinion that "it appears unfruitful at this time to attempt the adoption of a uniform system for selection of fertilizer grades for use throughout all States. The matter of reduction of the number of grades offered for sale in any given State or region seems of more pressing importance at present than the selection of grades according to a uniform system."

[Report of] subcommittee on fertilizer application, R. M. SALTER (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, p. 1049*).—Fertilizer placement experiments and some trials of mechanical devices for depositing fertilizers from seeding

equipment, together with experiments on the application, in Montana, of liquid phosphoric acid in irrigation water, are very briefly noted in a subcommittee report contributed from the Ohio Experiment Station.

[Report of] subcommittee on soil testing, M. F. Morgan (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, p. 1049*).—This report of the subcommittee on soil testing is a contribution from the Connecticut [New Haven] Experiment Station. Mention is made of a survey, in progress at the time of the report, of the use of rapid chemical tests for fertilizer requirement at the agricultural colleges and experiment stations. The development of a plan for securing collaborative trial of various methods now in use is also noted.

AGRICULTURAL BOTANY

Plant succession on solonetz soils in western North Dakota, H. C. Hanson and W. Whitman (*Ecology, 18 (1937), No. 4, pp. 516–522, figs. 4*).—According to this study by the North Dakota Agricultural College, "plant succession on bare areas resulting, according to the theory described by Kellogg [E. S. R., 72, p. 744], from salinization, solonization, and solodization on solonetz complexes in western North Dakota is described. The invaders on these bare areas are weedy forbs and low shrubs. The second stage in succession is characterized by grasses as *Agropyron*, *Puccinellia*, and *Poa buckleyana*. The third stage is dominated by *Buchloe dactyloides*, which is followed by the climax in which *Bouteloua gracilis*, *Stipa comata*, *Koeleria cristata*, *A. smithii*, and *Carex* spp. are the chief dominants. The course of succession toward the climax may cease at any stage due to the reoccurrence of salinization. All parts of an active solonetz area show continuous repetitions of the cycle of salinization, solonization, solodization, erosion, invasion, aggregation, reaction, succession, and partial reconstruction of the soil. During the course of plant succession from the bare area on the exposed B_2 horizon of the soloth toward the climax vegetation on normal soil the colloids change from the dispersed condition to flocculated, and the hard, columnar horizon becomes more or less prismatic and readily friable."

Effects of the 1934 drought on native vegetation of the upper Snake River plains, Idaho, J. F. Pechanec, G. D. Pickford, and G. Stewart (*Ecology, 18 (1937), No. 4, pp. 490–505, figs. 4*).—The ranges included in this cooperative study by the U. S. D. A. Bureau of Animal Industry and the Intermountain Experiment Station, Ogden, Utah, were typical of the sagebrush-wheatgrass spring-fall ranges located on the upper Snake River plains, where the average yearly precipitation (1925–35) is 9.79 in. and the average yearly temperature 47.5° F., ranging from 69.5° during July to 20.6° during December. The vegetation is dominated by *Artemisia tripartita*, while *Agropyron spicatum*, *Stipa comata*, and *Balsamorhiza sagittata* are the major constituents of the understory and also the chief forage plants. The immediate and delayed effects of drought on the native vegetation indicated the following to be true of the ungrazed areas: Perennial grasses in 1934 declined to 38 percent of their 1932 density and in the favorable 1935 season recuperated only to about 50 percent. The two major forage species (*A. spicatum* and *S. comata*) were so weakened that, in spite of the return to favorable conditions, death and disintegration of clumps continued. Decreases in basal area and severity of disintegration of the clumps were directly proportional to the original basal area. Although basal leaves attained (1934) only 60 percent of their average height, the plants surviving were unimpaired in vigor. The immediate effects of the drought (1934) were most severe on perennial herbs, which decreased to 25 percent of their 1932 density but apparently suffered no permanent injury. They were flowerless in 1934 but bloomed profusely in 1935. Annual weeds were almost

completely absent in 1934 but returned profusely in 1935. Decrease in the density of shrubs in 1934 to 46.8 percent of that in 1932 was due to the death of parts of the crowns or of entire plants. Normal height growth, profuse flower-stalk production, and increases in the density of perennial herbs and annual weeds so effectively masked the still depleted condition of the perennial grasses that these same ranges appeared superficially to be unimpaired in carrying capacity. On similar native semiarid ranges where either *A. spicatum* or *S. comata* is a major constituent of the forage cover, protracted injury will undoubtedly result during subsequent severe droughts.

Principles and methods of tree-ring analysis, W. S. GLOCK (*Carnegie Inst. Wash. Pub. 486 (1937), pp. VIII+100, pls. 14, figs. 44*).—Part 1 of this monograph takes up the methods and objectives of tree-ring analysis; part 2, ring formation in a ponderosa pine; and part 3, tree rings as climatic indicators. A selected bibliography and an index are provided. There are also included a foreword by A. E. Douglass and a contribution by G. A. Pearson.

Differentiation of the spiral vessels in Ricinus communis, F. M. SCOTT (*Bot. Gaz., 99 (1937), No. 1, pp. 69–79, figs. 21*).—This is a contribution by the University of California.

A critique of plant serology, II, III, K. S. CHESTER (*Quart. Rev. Biol., 12 (1937), Nos. 2, pp. 165–190; 3, pp. 294–321*).—Paper 2, Application of serology to the classification of plants and the identification of plant products, continues the critical review previously noted (E. S. R., 77, p. 601), the following subjects being discussed: Identification of plant products, application to plant systematics, serology of purified or altered plant proteins, serology of the plant toxalbumins and of nontoxic substances affecting blood, and serology of plant nonproteins.

Paper 3, Phytoserology in medicine and general biology—bibliography, is the concluding part (with 413 literature references). It discusses certain medical aspects of plant serology, the application of phytoserology in the study of certain basic biological problems, and its possibilities and limitations. When skillfully employed and when the reactions are very rigidly controlled and judged pragmatically, the serological method has already served in the solution of important botanical problems and gives promise of far-reaching value as an adjunct to many phases of botany.

Plant parts of deciduous fruits which give evidence of being favorable for tissue culture, H. B. TUKEY (*Natl. Acad. Sci. Proc., 23 (1937), No. 11, pp. 577–580, figs. 5*).—In this contribution from the New York State Experiment Station, attention is called to experimental evidence that three tissues within the young fruit of the peach appear favorable for artificial tissue culture as follows: The micropylar region of the integuments of the ovule, the entire integuments, and the placental region of the inner wall of the ovary.

Cultivation in vitro of excised pea roots, J. BONNER and F. ADDICOTT (*Bot. Gaz., 99 (1937), No. 1, pp. 144–170, figs. 8*).—The basic medium described contains 4 percent sucrose, besides inorganic salts. Freshly excised root tips 3–4 mm long grew 60–95 mm in this medium during the first week and 200 mm or more during the first 2 weeks. Yeast extract (0.01 percent) must be added for good growth in passages after the first. With weekly transfers, roots have been kept in culture for 4 mo. on the basic medium plus yeast extract. Crystalline vitamin B_1 proved capable of partially replacing yeast but was unable to support continued optimal growth in later passages. A mixture of pure, crystalline amino acids replaced that portion of the yeast extract activity not due to vitamin B_1. The mixture of these substances gave a highly satisfactory, completely known medium for culture of excised pea roots, supporting growth as well as or better than media containing yeast extract. Substances such

as vitamin B_1 (necessary in minute amounts for growth of isolated roots but normally supplied by some other part of the intact plant) are carriers of a growth correlation and hence are to be regarded as phytohormones.

Mechanism and quantitative application of the pea test, J. Van Overbeek and F. W. Went (*Bot. Gaz.*, 99 (1937), No. 1, pp. 22–41, figs. 8).—When growing pea-seedling stems are split and immersed in an auxin-containing solution the two halves curve inward, this curvature being proportional to the logarithm of auxin concentration and due to differential growth. The epidermis side of the halved stems grew faster than the wounded inside, and this growth difference was in turn due to the fact that auxin is unable to enter the stem through the wounded surface. When auxin was forced into the halved stems by infiltration with auxin solutions, the inside grew as much as the unwounded epidermis side. The pea test can thus be successfully used for quantitative auxin determinations (technic described). The pea test curvature depends on the pH of the auxin solutions, at greater acidities greater curvatures being obtained. As in the oat coleoptile, the sensitivity to auxin has daily and seasonal variations. A wide variety of pea races proved suitable for the test, all but 2 of the 35 varieties investigated giving curvatures. The rate of curvature was shown to be independent of the auxin concentration, but the higher the concentration the longer was the time during which the curvature proceeded.

Growth of Avena coleoptile and first internode in different wave-length bands of the visible spectrum, E. S. Johnston (*Smithsn. Misc. Collect.*, 96 (1937), No. 6, pp. 19, figs. 4).—"Two series of experiments were conducted in which the growth of the coleoptile and first internode (mesocotyl) of *A. sativa*, Markton variety, was studied in different wavelength regions of the visible spectrum. Radiation of low intensity greatly depressed the growth of the first internode as compared to that in darkness. On the other hand, growth of the coleoptile was depressed in darkness. Total growth of the entire seedling (coleoptile plus first internode) for the 4-day periods of all these experiments was slightly greater in darkness than in light. Although the total length of seedling was not greatly dependent on intensity of illumination, the ratios of first internode and coleoptile to total length were extremely critical indexes to intensity of illumination. It is extremely difficult to get conditions dark enough to avoid light effects on these ratios. All wavelengths give much the same tendency to decrease the ratio of first internode to total length, and this effect increases with light intensity. Yet there is a wavelength effect yielding a minimum ratio at about 6,500 a. u.

"It would appear that growth of the coleoptile retards the growth of the first internode and that the growth of the one tissue takes place at the expense of the other. Light probably acts more as a redistributing agent of the growth substances than an inactivating agent. However, even at the low intensities here employed, there was a slight indication that some inactivation occurred, since the average total length of the illuminated seedlings was slightly less than that of the dark controls."

Ascorbic acid in the Avena coleoptile, W. G. Clark (*Bot. Gaz.*, 99 (1937), No. 1, pp. 116–124).—Ascorbic acid was found in considerable concentrations in coleoptiles from etiolated oat seedlings. Reduced ascorbic acid was present in higher concentrations in tips than in bases of coleoptiles, and oxidized ascorbic acid showed the reverse gradient of distribution. The distribution of ascorbic acid in the coleoptiles corresponded with the chlorophyll distribution in plants grown in light, but did not depend on chlorophyll for either its presence or its distribution in plants grown in darkness. Light increased and aging decreased the concentration in the coleoptiles. It is not present in the germinating seed

but is synthesized in the coleoptile from a precursor in the seed. Reduced ascorbic acid is oxidized more by extracts from basal than from apical sections of the coleoptiles. This destruction gradient corresponds with the destruction gradient of auxin in the coleoptile. Ascorbic acid is not a cell-elongation hormone like auxin, nor does it facilitate the action of auxin in the standard oat or pea tests.

The effect of auxins upon protoplasmic streaming, K. V. Thimann and B. M. Sweeney (*Jour. Gen. Physiol., 21 (1937), No. 2, pp. 123–135, figs. 7*).—Indole-3-acetic acid was found to increase the rate of streaming in epidermal cells of oat coleoptiles at 0.5–0.002 mg per liter, the maximum increase being induced by 0.01 mg per liter. This concentration is about that which, applied in agar to one side of the decapitated coleoptile, would give a curvature of 1°, i. e., within the range active in growth promotion but much less than that producing maximum elongation in immersed sections of oat coleoptiles. This accelerating effect is easily determined quantitatively by comparison with the streaming in control coleoptiles in pure water. Concentrations of indole-3-acetic acid higher than 0.5 mg per liter inhibited streaming, paralleling the effect of high auxin concentrations in inhibiting elongation, although the inhibition of streaming was obtained at much lower concentrations than those inhibiting elongation. The effects of indole-3-acetic acid on streaming are not specific, but appear to be common to auxins in general. On the other hand, certain substances known to affect streaming in other materials do not produce any effect comparable to that of auxin. Ethylene chlorohydrin, histidine, and urea in all concentrations were without effect on streaming in the oat coleoptile within the first 30 minutes' treatment. The auxin-induced effects were not due to pH, and the action on streaming here studied evidently differs from the restarting of streaming after cessation as reported in *Vallisneria*. On the contrary, the effect of auxin here referred to is on normal streaming and occurs immediately and at concentrations in the same range as those inducing growth. The curve of effect against concentration parallels that for growth, though the actual concentration values differ. It is, therefore, deemed reasonable to suppose that the effect of auxins on streaming is closely connected with one of the first stages of its effect on the growth process.

Effect of indoleacetic acid on growth and chemical composition of etiolated bean plants, J. W. Mitchell and W. E. Martin (*Bot. Gaz., 99 (1937), No. 1, pp. 171–183, figs. 4*).—Applied to the first internode of etiolated bean seedlings, 3 percent β-indoleacetic acid-lanolin mixture induced gall formation at the application point and root development in the galls, and in many cases dense rows of roots developed the entire length of the hypocotyls. The first and second internodes, petioles, and leaves of treated plants increased less in volume, fresh weight, dry weight, and length than corresponding parts of controls. The histological responses of treated regions of plants grown in continuous darkness closely resembled those of comparable plants grown in alternating light and darkness, as reported by others. The histological differences between treated and untreated plants under continuous darkness were very great. Indoleacetic acid application to the first internode of etiolated plants retarded the transport of materials from the cotyledons and also the uptake of water by the plants. Analyses of treated and untreated plants indicated that indoleacetic acid greatly affects the direction of transport of materials from the cotyledons. Materials were conducted from the cotyledons upward only as far as the first internode (point of treatment) in the treated plants. At the end of the experiments, transverse sections through the treated parts of plants grown in darkness showed no apparent evidence of mechanical blockage

or inhibition of development in the conductive tissues. No significant differences were noted in the amount of dry matter respired by treated v. control plants.

Physiologic curve of response to phytohormones by seeds, growing plants, cuttings, and lower plant forms, N. H. Grace (*Canad. Jour. Res., 15 (1937), No. 11, Sect. C, pp. 538–546, pls. 2, fig. 1*).—"In all plant species tested, increasing concentrations of phytohormones produced responses falling on a physiologic curve from minimum through optimum to maximum which, if exceeded, led to injury and death. Indolylacetic acid, its butyric and propionic homologues, naphthylacetic acid, their salts, and mixtures gave similar results. Treating seeds with hormones incorporated in adsorbent dust stimulated both root and top growth markedly, with less danger of overdosage than in solution treatment. Dosages equivalent to 50 to 250 mg per acre applied as dilute solutions to soil growing young lettuce and tomato plants covered the optimum range of stimulation to growth. Dust treatment of cuttings proved very convenient and successful in inducing rooting, the plants again showing a wider range of tolerance to dusts than to solutions. Fermentation of sugar by yeast responded to hormone stimulation. Various practical applications are discussed."

Parthenocarpic fruits induced by spraying with growth promoting compounds, F. E. Gardner and P. C. Marth (*Bot. Gaz., 99 (1937), No. 1, pp. 184–195, figs. 4*).—The main studies here reported relate to the spraying of holly blooms of different ages with several growth-promoting substances, the influence of repeated sprayings, the development of parthenocarpic fruits, abscission in relation to second growth, and fruit setting by applying indoleacetic acid to the soil; to similar but less successful tests with strawberries; and to negative results with apple and grape. The general conclusion is "that not all plants can be expected to respond as readily as the holly to spraying with these compounds. Entirely apart from scientific interest, however, the results with holly do constitute an example of the practical value of the use of growth-promoting compounds in effecting fruit setting."

Root development of Viburnum dilatatum and Cotoneaster divaricata with the use of growth substances, L. C. Chadwick (*Arborist's News, 2 (1937), No. 10, pp. [3, 4], fig. 1*).—Preliminary experiments by the Ohio State University indicated that considerable root stimulation could be expected from soaking the roots of the deciduous shrubs used in some of the growth-promoting substances.

Can hormone-like substances be used to stimulate root production on trees? P. E. Tilford (*Arborist's News, 2 (1937), No. 10, pp. [1–3], figs. 2*).—Seedlings of American elm and arborvitae, Norway spruce, white pine, hard maple, black oak, pin oak, and black walnut were treated by submerging the roots for 46 hr. in solutions containing indolebutyric, indoleacetic, indolepropionic, and phenylacetic acids. When the seedlings were taken out of the sand, very marked stimulation of new root development was evident on all species except white pine and Norway spruce. "The results of this preliminary experiment [by the Ohio Experiment Station] seem to indicate that root-stimulating substances may be of value in certain phases of tree culture."

Utilization of plant hormones by the commercial nursery, W. S. Flory (*Florists Exch. and Hort. Trade World, 89 (1937), No. 15, p. 8*).—This contribution by the Texas Experiment Station presents a brief review of present information with special reference to commercial applications.

Effects of sudden changes of temperature on elongation rate of primary root, L. E. Fox (*Bot. Gaz., 99 (1937), No. 1, pp. 196–206, fig. 1*).—The length of time during which roots of Burpee's Stringless Greenpod bean roots were exposed to low temperatures influenced their elongation rate when returned to 20° C. After two to three 24-hr. periods the elongation rate tended to return to

that of the controls. The time of day at which the root tips were exposed determined the elongation rate of the roots when transferred to 25°. Roots chilled when more cells were in prophase were retarded in elongation rate. Cells formed by the mitotic activity of embryonic cells started to elongate within the first 24 hr. after their formation. It is stated that other factors may influence the results obtained. Exposing roots grown at 15° to high temperatures gave similar results to those in roots exposed to low temperatures. The age and initial length of the roots failed to affect their elongation rate when exposed to low temperatures.

Polarized growth and cell studies in the first internode and coleoptile of Avena in relation to light and darkness, G. S. Avery, Jr., P. R. Burkholder, and H. B. Creighton (*Bot. Gaz., 99 (1937), No. 1, pp. 125–143, figs. 8*).—The ratio of internode to coleoptile lengths differed markedly among 20 varieties of 3 *Avena* species germinated in complete darkness and with preliminary light treatment in the early stages of soaking followed by growth in darkness. The final length of the first internode of Victory oats grown under different intensities of weak Mazda light varied inversely with the intensity. A similar inhibition in proportion to neon light intensity was found at intensities below 0.1 erg/mm^2/sec. Early germination stages in Victory oats under 1,000-w Mazda light and in darkness indicated that the internode elongated slightly during early swelling in both cases. In darkness, further polarized growth occurred in the internode but in strong light it ceased early and shifted to the coleoptile. Different amounts of light influenced polarized growth in different organs and tissues in different ways. In complete darkness the internode grew extensively, and the coleoptile was somewhat shorter than in plants receiving small amounts of light in the early germination stages. Analyses of cell behavior in the first internode when grown to maturity under different intensities of Mazda light indicated both cell division and enlargement to be responsible for polarized growth. During early germination, cell enlargement up to a certain size occurred in the first internode whether the seedlings were grown in light or darkness, and in later development cell division occurred in darkness and under very low intensities but not in bright light. The size of dividing cells during early germination in darkness was somewhat less than that of cells of internodes grown in light. In darkness, both cell division and elongation contributed to elongation of the internode. The number of internode cells increased from embryo to maturity by 8.5 times and the average cell length by 30 times. The shortening effect of light on the first internode of the axis was induced primarily by inhibition of cell division. It is suggested that the influencing factors are probably concerned with certain substances necessary to cell division, and if so such substances must be rendered ineffective or are changed in their movement path by very low light intensities.

Photoperiodism and enzyme activity in the soybean plants, A. D. Hibbard (*Missouri Sta. Res. Bul. 271 (1937), pp. 48, figs. 8*).—In the leaves of short-day Biloxi soybeans, catalase activity was at first inhibited. It began to increase about the tenth day, became equal to the long-day plants near the eighteenth day, and was increasingly greater thereafter. Catalase activity in the tip of the short-day plant was inhibited from the first, and maximal depression was reached about the twentieth day. Afterward there was a slight increase, but the activity was always less than in the tips of the long-day plants. Peroxidase was more active in both the tips and leaves of the short-day plants. This difference, small at first, steadily increased with continued treatment. Invertase tended to increase in the short-day plants, similar in trend to peroxidase. Amylase was unaffected by the photoperiods used. Reductase was par-

tially inhibited by the short-day, but showed no definite change in response to photoperiod.

Plants grown without nitrates showed reductase activities similar to those well supplied. If nitrogen metabolism is affected by the photoperiod so that this element becomes a limiting factor in growth, some phase other than nitrate reduction must be preventing its utilization.

Catalase and peroxidase activities change in an unlike manner in response to length of day. Changes in enzymatic activity can be observed as early as five days after treatments begin, and these differences can be detected prior to any observable morphological or chemical changes. The trends in relative enzymatic activities are probably to be correlated more closely with type of growth than with stage of reproductive development.

The induction period in photosynthesis, E. L. Smith (*Jour. Gen. Physiol., 21 (1937), No. 2, pp. 151–163, figs. 5*).—"Measurements on the photosynthesis of *Cabomba caroliniana* show an induction period at low and high light intensities and CO_2 concentrations. The equation which describes the data for *Cabomba* also describes the data obtained by other investigators on different species. The phenomenon is thus shown to be similar in plants representative of three phyla. A derivation of the induction period equation is made from a consideration of the cycle of light and dark processes known to occur in photosynthesis. The equation indicates that light intensity enters as the square, and that the same light reactions are involved as those which affect the stationary state rates. However, a different dark reaction appears to limit photosynthesis during the induction period."

Change in mineral composition of the tomato plant irradiated with a quartz-mercury vapor lamp and its relation to the level and ratio of calcium and phosphorus in the nutritive medium, W. D. Stewart and J. M. Arthur (*Contrib. Boyce Thompson Inst., 9 (1937), No. 2, pp. 105–120, fig. 1*).—"Tomato plants were grown outside, in the greenhouse, and under shading cloth on fractional solution cultures. The plants were alternated at 24-hr. intervals between McMurtrey's [E. S. R., 69, p. 362] 'complete minus phosphorus or calcium' solutions and single salt solutions containing calcium or phosphorus or both. Rate of supply of calcium and phosphorus and ratio of calcium to phosphorus were varied. The plants were grown 4–6 weeks on these solutions and their response to irradiation under a quartz-mercury vapor lamp as reflected by change in ash, phosphorus, and calcium content observed. Results from the data are summarized [as follows]: (1) Plants grown on solutions lacking calcium or phosphorus showed no increase in ash, calcium, or phosphorus on irradiation. (2) Level of supply of calcium or phosphorus and not ratio of calcium to phosphorus determines presence or absence of response to irradiation. Without altering the ratio of calcium to phosphorus (high ratios), presence or absence of response was secured by controlling the rate of solution renewal. (3) Plants grown on solutions deficient in phosphorus (low renewal rate) were high in ash. Increase in the concentration of phosphorus of the solution lowered the ash content. (4) Decreasing light intensity during the summer increased dry weight, ash, and phosphorus content but decreased calcium. (5) On solutions deficient in phosphorus (high ratio of calcium to phosphorus) the response to irradiation was increase in ash and calcium, whereas on solutions deficient in calcium (high phosphorus-low calcium) the response was increase in ash and phosphorus. With intermediate values for ratios of calcium to phosphorus the response was increase in ash, calcium, and phosphorus. (6) A reciprocal relationship between calcium and phosphorus was observed. (7) Phosphoric acid at concentrations of 1 p. p. m. was an excellent source of phosphorus for the tomato plant."

Combined nitrogen and the nitrogen fixation process in leguminous plants, P. W. WILSON and F. C. WAGNER (*Wis. Acad. Sci., Arts, and Letters. Trans., 30 (1937), pp. 43–50*).—Data from the experiments reported in this contribution by the University of Wisconsin suggested the following hypothesis: "The response of the symbiotic system of an inoculated leguminous plant to combined nitrogen will depend on how the latter alters the carbohydrate-nitrogen relation of the plant. In a plant high in carbohydrate, addition of a small quantity of combined nitrogen will favor development of nodules and fixation of free nitrogen, but with large quantities the reverse obtains. The significance of these observations with reference to the more general problem of the biochemistry of the fixation process" has been previously noted (E. S. R., 75, p. 21). On fields low in combined nitrogen planted with small-seeded legumes, it is possible that a disastrous delay in onset of fixation may result from an excessive carbohydrate-nitrogen balance. In such cases, additions of small amounts of combined nitrogen should prove economical.

In testing bacterial cultures for inoculation of clover, alfalfa, and other small-seeded legumes, the results may under certain conditions be vitiated because of an extremely wide carbohydrate-nitrogen balance. If the plants in such tests are supplied with small amounts of combined nitrogen a better evaluation of the cultures might be attained, and it is possible that the time for the tests would be lessened because of stimulation of the early plant development.

Fixation and transfer of nitrogen in the soybean, P. W. WILSON and W. W. UMBREIT (*Zentbl. Bakt. [etc.], 2. Abt., 96 (1937), No. 20–23, pp. 402–411*).—Data from this study by the University of Wisconsin indicate that during the period of greatest fixation 80–90 percent of the nitrogen fixed in the nodule is transferred to the remainder of the plant, but during the early stages there was evidence that more of the nitrogen fixed was retained by the nodule. However, the amount transferred may not be constant at any one time but may increase slowly with the plant development.

As to the current hypotheses of nitrogen transfer, it is concluded that the same types of data could be obtained irrespectively of which of the four alternative mechanisms were involved. Hence it is believed that the results cannot be used in support of any particular hypothesis.

The metabolism of the organic acids of the tobacco leaf during culture, G. W. PUCHER, A. J. WAKEMAN, and H. B. VICKERY (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 523–534*).—Malic, citric, and oxalic acids, the three chief organic acids of the tobacco leaf, and the total organic acidity were found by the Connecticut [New Haven] Experiment Station to undergo very little change in absolute amount during culture of the leaves in the light, though extensive photosynthesis occurred. In darkness, however, malic acid diminished profoundly and citric acid increased, while oxalic acid and the total organic acidity remained unchanged. Consideration of the possible sources from which the newly formed citric acid could have been derived indicated malic acid to be the most probable. The amount of soluble carbohydrate present was quite inadequate for it, and there was little likelihood on chemical bases that it could be derived from protein. A mechanism whereby malic acid may be converted into citric acid is suggested, and it is shown that the amounts of acids involved in the interchange are such that this theory is a reasonable explanation of the results.

Boron in agriculture, R. W. G. DENNIS and D. G. O'BRIEN (*West of Scot. Agr. Col., Res. Bul. 5 (1937), pp. 98, pls. 14*).—This monograph discusses boron in relation to the soil and to plant growth and health, including boron toxicity and the boron deficiency diseases (taken up by plant families); the boron re-

quirements of various crops and its function in the plant; and methods of application. Bibliographies accompany the different sections, and an 11½-page general bibliography concludes the work.

Proceedings of local branches of the Society of American Bacteriologists: Seventh meeting, New York City Branch (*Jour. Bact., 32 (1936), No. 5, pp. 587, 588*).—Abstracts of the following two historical contributions by the New Jersey Experiment Stations are included: Sergei Nikolaevitch Winogradsky, a Great Microbe Hunter, by S. A. Waksman; and Winogradsky's Discovery and Studies of Autotrophic Bacteria, by R. L. Starkey.

New principles for the classification of bacteria, O. RAHN (*Zentbl. Bakt. [etc.], 2. Abt., 96 (1937), No. 13–19, pp. 273–286, fig. 1*).—In this contribution by Cornell University the system proposed for Eubacteriales emphasizes sporulation, Gram stain, and oxygen demand as the primary characters for subdivision in addition to cell form and sporulation. New families are proposed, but only one new genus, *Enterobacter*, for the colon-typhoid group. However, many new genera of the past 20 yr. have been canceled. About one-fourth of the Eubacteriales in Bergey's Manual are considered "unclassifiable," and by their elimination a system emerges which is claimed to be more "natural" than previous systems. The unclassifiable species may remain under their present genus names in one family, Bacteriaceae, arranged in an arbitrary key system, until means for their separation into natural genera have been found.

The genus Phytomonas, C. ELLIOTT (*Phytopathology, 27 (1937), No. 12, pp. 1181, 1182*).—Citations and quotations are given to show that the genus name *Phytomonas* was originally used for a protozoan group and is therefore according to resolutions adopted by the Second International Congress of Microbiology, London, 1936, not available for bacteria.

Studies on the nodule bacteria.—VIII, Influence of ash content of the nodules on the growth of nodule bacteria, with a special reference to the titanium salts; IX, On the electrical properties of the accessory substance, A. ITANO and A. MATSUURA (*Ber. Ōhara Inst. Landw. Forsch., 7 (1937), No. 4, pp. 501–527, fig. 1*).—These two papers are in continuation of investigations previously reported (E. S. R., 78, p. 22).

Studies in the sexuality of the Heterobasidiae, H. L. BARNETT (*Mycologia, 29 (1937), No. 5, pp. 626–649, figs. 3*).—This is a contribution by Michigan State College.

Observations on sexual relations in Hypomyces ipomoeae, A. W. DIMOCK (*Mycologia, 29 (1937), No. 1, pp. 116–127, figs. 2*).—From this study by the University of California "it is proposed that each single-ascospore mycelium is hermaphroditic, but self-sterile. Each monoploid nucleus must, then, possess the potentialities of both sexes. Hence, sexual-reaction factors, rather than sex factors or sex chromosomes as such, are segregated at meiosis. The data strongly suggest that a single allelomorphic pair is concerned."

Miscellaneous notes on the Ustilaginales, G. L. ZUNDEL (*Mycologia, 29 (1937), No. 5, pp. 583–591, fig. 1*).—This taxonomic contribution on the smut fungi by the Pennsylvania State College includes two new combinations, two new species, and one new name.

Growth factors for bacteria, III, IV (*Jour. Bact., 33 (1937), No. 2, pp. 207–242, figs. 5*).—The following two papers are contributions from the University of Wisconsin (E. S. R., 76, p. 770).

III. *Some nutritive requirements of Lactobacillus delbrückii*, E. E. Snell, E. L. Tatum, and W. H. Peterson (pp. 207–225).—Aqueous extract of potato added to simple media stimulated growth and acid production of a number of lactic acid bacteria. Tryptophane proved essential to the growth of *L. delbrückii*. Two unknown factors necessary were present in liver extract.

IV. *An acidic ether-soluble factor essential for growth of propionic acid bacteria*, H. G. Wood, E. L. Tatum, and W. H. Peterson (pp. 227-242).—An ether-soluble factor obtained from yeast extract proved indispensable for growth of all tested cultures of propionic acid bacteria on a synthetic ammonium sulfate medium. Addition of hydrolyzed casein greatly improved their growth. This factor (properties described) was found in all materials tested (yeast, potato, corn and liver extracts, and corn steep) which supported good growth. "Since vigorous growth and fermentation can be obtained in a synthetic medium with only small amounts of unknown material, such a medium should be of value in quantitative studies on the mechanism of the propionic acid fermentation."

Growth factors for bacteria, V, VI (*Biochem. Jour., 30 (1936), No. 10, pp. 1898-1904, figs. 4; 31 (1937), No. 10, pp. 1789-1799, fig. 1*).—Continuing the above studies, two papers are presented.

V. *Vitamin B_1, a growth stimulant for propionic acid bacteria*, E. L. Tatum, H. G. Wood, and W. H. Peterson.—The stimulating action of protein hydrolysates on acid production by certain propionic acid bacteria was found to be due in part to a factor which is neither an amino acid nor a part of a protein molecule. This stimulant was isolated from unhydrolyzed caseinogen, egg albumin, yeast extract, and milk powder by extraction with alcohol or acetone. The effect was most pronounced in the presence of amino acids. Inositol, pantothenic acid, ascorbic acid, hepatoflavine, nicotinic acid amide, and indoleacetic acid could not replace this stimulant. Its properties were similar to those of vitamin B_1 and crystalline vitamin B_1 (Merck) completely replaced it in a concentration of 0.5γ per 100 cc of medium.

VI. *Fractionation and properties of an accessory factor for lactic acid bacteria*, E. E. Snell, F. M. Strong, and W. H. Peterson.—"A procedure is described for obtaining from an alcohol-soluble liver extract an acidic, ether-extractable substance which is essential for the normal growth of 14 species of lactic acid bacteria. The effect of the concentrate is evident in amounts as low as 0.003γ per cubic centimeter of medium. The active substance is rather labile to heat, acid, and especially to alkali, and is somewhat labile to mild treatment with bromine and nitrous acid. It is not affected by a number of common precipitating agents or by hydrogen peroxide. Comparison of properties and direct replacement tests seem to indicate that the active substance differs significantly from other bacterial growth factors."

A new culture medium for rhizobia, W. A. Albrecht and T. M. McCalla (*Jour. Bact., 34 (1937), No. 4, pp. 455-457*).—In this contribution by the Missouri Experiment Station the culture medium formula given includes calcium gluconate as the source of calcium for rhizobia.

Studies on anaerobic bacteria.—XII, The fermentation products of Clostridium thermosaccharolyticum, N. O. Sjolander (*Jour. Bact., 34 (1937), No. 4, pp. 419-428*).—Continuing this series by the University of Wisconsin (E. S. R., 74, p. 179), "a malt-sprouts base medium with calcium carbonate appeared to be the most satisfactory of the several media tried for complete sugar utilization by *C. thermosaccharolyticum*. The products of glucose fermentation were carbon dioxide, hydrogen, acetic acid, butyric acid, and lactic acid. The ratio of products varied with change in temperature and appeared to be influenced by access of atmospheric oxygen to the fermentation. Neutral volatile products were either absent or present in very small amounts. Tests for formic acid, succinic acid, acetylmethylcarbinol, and 2,3-butylene glycol were negative. The products formed from xylose were the same as those from glucose."

Reductive processes of Clostridium butylicum and the mechanism of formation of isopropyl alcohol, A. F. Langlykke, W. H. Peterson, and E. B. Fred (*Jour. Bact., 34 (1937), No. 4, pp. 443-453*).—In this study by the University of

Wisconsin "acetone and acetylmethylcarbinol added to glucose fermentations were reduced by *C. butylicum* to the corresponding alcohols, isopropyl alcohol, and 2,3-butylene glycol. The quantity of acetone reduced varied with different strains of the organism. Added pyruvic acid was fermented to the same products as are formed from glucose. Addition of acetone, pyruvic acid, or acetylmethylcarbinol favors the production of isopropyl alcohol and acetone from the carbohydrate at the expense of butyl alcohol and butyric acid production. A proposed explanation of the effect of hydrogen acceptors is that both three- and four-carbon compounds may arise from a common precursor, acetoacetic acid."

Isolation of toxic substances from the culture filtrates of Trichoderma and Gliocladium, R. Weindling (*Phytopathology, 27 (1937), No. 12, pp. 1175–1177*).—Substances toxic to other fungi were removed from culture filtrates of *Trichoderma* and *Gliocladium* spp. by extracting with chloroform. The toxic materials produced by *Gliocladium* were more stable than those produced by *Trichoderma*. The fungus from the culture filtrate of which a crystalline toxic substance has been isolated is not, as recently reported, a *Trichoderma* but a *Gliocladium* resembling *G. fimbriatum*. No close taxonomic relationship can be established between *Gliocladium* and *Trichoderma* on the basis of chlamydospore formation, especially since they seem to be frequently absent or inconspicuous in both groups. The isolates used were similar in regard to their pathogenic or antagonistic activity toward certain other fungi when associated with them in culture media, but this is a physiological character that they have in common also with many unrelated organisms.

GENETICS

The nature of recessive genes and the biomechanic theory of inheritance, A. L. Hagedoorn (*Genetica ['s Gravenhage], 19 (1937), No. 4–5, pp. 434–445, figs. 4*).—The determinant concept of heredity is contrasted with the biomechanic theory of inheritance. It seems evident that quantitative differences in the amount of one gene may be a matter of presence and complete absence. Mendelian segregation occurs in cases of complete absence of the recessive gene such as is the case in sex linkage (barring) and in chromosome deletions.

The structure of the plant cell: The inclusions of the cytoplasm and in particular the chondriosomes and plastids, A. Guilliermond, trans. by A. G. Lang (*Raleigh: N. C. State Col., 1935, pp. 55, figs. 20; also in Protoplasma, 16 (1932), No. 2, pp. 291–337, figs. 20*).—A technical discussion.

Methods of inducing chromosome doubling in plants by treatment with colchicine, A. F. Blakeslee and A. G. Avery (*Science, 86 (1937), No. 2236, p. 408*).—This is an abstract of a paper before the National Academy of Sciences reporting the development of tetraploid shoots or tissues resulting from the doubling of chromosomes in meristematic cells of normal diploid plants induced by treating with the alkaloid colchicine. Apparent changes of this type were brought about by this means in the following genera: *Datura* (several species), *Portulaca* (two species), *Cosmos* (two species), *Phlox, Stellaria, Nicotiana, Digitalis, Mirabilis, Tropaeolum, Cheiranthus, Raphanus, Cucurbita, Trifolium, Medicago,* and *Allium*.

Studies in the inheritance of physiological characters.—III, Hybrid vigour in the tomato.—1, Manifestations of hybrid vigour from germination to the onset of flowering, E. Ashby (*Ann. Bot. [London], n. ser., 1 (1937), No. 1, pp. 11–41, figs. 11*).—Following earlier papers on heterosis in maize (E. S. R., 68, p. 602), the author presents observations on the growth and development of certain carefully inbred strains of tomatoes and their F_1 progeny. In two

of three combinations there was significant size heterosis, and the hybrids, as compared with their parents, had greater wet and dry weight, greater height, more leaves, greater total leaf area, and greater total assimilation rate. The embryos of the hybrids showing size heterosis were heavier and longer than those of the parents, but the cells were no larger than the embryos. Apparently, size heterosis in the hybrids was due to the maintenance of the initial advantage due to larger embryos.

Hybridization experiments with natural variants of Hypomyces ipomoeae, A. W. Dimock (*Bul. Torrey Bot. Club, 64 (1937), No. 8, pp. 499–507, fig. 1*).—Hybridization experiments by the University of California strongly indicated that each of the variants differs from normal in a single gene or in a few closely linked genes. In each case the gene or gene-group determining expression of the variant characters lay in a different linkage group from the sexual-reaction gene. The *diffusa* variant produced a few fertile, nonosteolate perithecia when inbred, but attempts to inbreed the *rosa* variant proved unsuccessful. Neither of the variant strains proved well adapted to persist in competition with the normal.

[**Papers on animal genetics**] (*Genetics, 23 (1938), No. 1, pp. 141, 142, 143, 144, 146, 147, 148, 149, 150, 151, 152, 153, 155, 158, 164, 165, 166, 172, 174, 176, 177; also in Genet. Soc. Amer. Rec., 6 (1937), pp. 141, 142, 143, 144, 146, 147, 148, 149, 150, 151, 152, 153, 155, 158, 164, 165, 166, 172, 174, 176, 177*).—Brief abstracts are given of the following papers on animal genetics presented before the 1937 meetings of the Genetics Society of America: Anemia, a Recessive Lethal in the Rat, by R. Bogart, S. E. Smith, and G. Kimball; Hair Color Changes in Mice as Indicators of the Spread of X-ray Effects, by J. A. Cameron; Biometric Study of White Spotting in the Guinea Pig, by H. B. Chase; A Dominant Short-Tail Mutation in the House-Mouse With Recessive Lethal Effect, by L. C. Dunn and S. Glücksohn-Schoenheimer; Measuring the Value of Breeding Methods in Improving Livestock, by H. D. Goodale; The Inheritance of Coastal and Vertebral Variations in the Rabbit, by E. L. Green; Inheritance of Resistance to Transplantable Cancer in Rats, by M. F. Guyer, F. E. Mohs, and P. E. Claus; Homeotic Variations in the Axial Skeleton of *Mus musculus*, by A. G. Humes and P. B. Sawin; Naked, a Sex-Linked Semilethal Mutation in the Domestic Fowl, by F. B. Hutt; A Genetic Analysis of Species Differences in Columbidae, by M. R. Irwin; A Lethal Mutation in Japanese Bantam Fowl, by W. Landauer; Genetics of Multiple Births, by J. W. MacArthur; A Quantitative Study of Genic Effects on Guinea-Pig Coat Color, by E. S. Russell; Inheritance of Normal Agglutinins for Human Erythrocytes in Rabbit Serums, by P. B. Sawin, K. M. Wheeler, C. A. Stuart, and A. M. Griffin; Qualitative and Quantitative Differences in the Morphology of Spermatozoa From Members of Two Dove Species, and From Their F_1 and Backcross Hybrids, by E. W. Shrigley; A Colorimetric Method for the Quantitative Study of Melanin in Feathers, by D. G. Steele; Mapping the Genes of the Fowl, by D. C. Warren; and A Mutation Causing the Loss of One Pair of Palatal Ridges in the House Mouse, *Mus musculus*, by G. W. Woolley.

[**Genetics studies by the Wisconsin Station**] (*Wisconsin Sta. Bul. 439 (1937), pp. 78–82, fig. 1*).—The results are briefly reported of experiments showing that cows may ovulate without coming into heat, by L. E. Casida and W. G. Venzke; studies of the relationship between sperm abnormalities and partial fertility in bulls, by Casida, Venzke, and F. Fountaine; relation of heredity and environment to the occurrence of cleft palate in swine, by L. J. Cole and J. M. Fargo; the similarity between albinism in White Leghorns and White Wyandottes, by Cole and C. E. Holmes; and the fact that lifetime averages are more reliable than individual records for selecting dairy cattle, by G. E. Dickerson.

Deviations from expected frequencies in the theory of inbreeding, M. S. BARTLETT (*Jour. Genet., 35 (1937), No. 1, pp. 83–87*).—A presentation of deviations from the expected frequencies for the numbers of heterozygotes in inbreeding formulas.

A summary of lethal characters in animals and man, O. N. EATON (*Jour. Heredity, 28 (1937), No. 9, pp. 320–326*).—A summary and brief description with literature references regarding lethals in cattle, horses, sheep, swine, poultry, and miscellaneous small animals and man.

Physiology of dairy cattle.—III, Genetics, A. D. BUCHANAN SMITH (*Jour. Dairy Res. [London], 8 (1937), No. 1, pp. 131–142*).—Part 3 of this series (E. S. R., 78, p. 689) is a comprehensive review of recent publications on genetics of milk and fat production, conformation, and progeny testing.

The relation of hair and skin pigmentation to colour inheritance in cattle, with some notes on guinea-pig hair pigmentation, R. BOGART and H. L. IBSEN (*Jour. Genet., 35 (1937), No. 1, pp. 31–59, pls. 4*).—The form and distribution are described from the Kansas Experiment Station of the two kinds of pigment, red and black, in the hair and skin of cattle, varying as to the presence of the following genes and their allels, previously described (E. S. R., 70, p. 605): Black (B), red (R), black-spotting (Bs), recessive white-spotting (s), dominant white spotting (S^h), and white (NN). Black pigment was always present, even in white hairs, as granules or clumps, but in varying degrees of concentration and location. Red pigment varied in shade, was nongranular, and completely diffused in the hair, although it sometimes appeared granular in the skin. All cattle are homozygous for B, but the allel in the guinea pig causes chocolate pigment. Evidently red pigment is also always present in black hairs of cattle, indicating that the R gene is generally present.

Black hairs due to the gene Bs for black spotting, acting on B in Jerseys and Ayrshires, showed the presence of red as well as black pigment. Black hair as in Angus cattle is due to the extension gene E acting on B. Red hair (ee bb $bsbs$) differs from Bs hair in the amount of black pigment present. The shade of red hair is controlled by the shade of red pigment and the amount of black pigment present. Examination was made of four kinds of white hair due to s (recessive white-spotting, as on Ayrshires), S^h (Hereford spotting), NN (dominant white in Shorthorns), and c (albinos). Only a few hairs and those of albinos from the Minnesota Experiment Station were devoid of pigment. The others had varying amounts of black pigment in the medulla, some had a little in the cortex, but there was no red pigment in the white hairs. If black pigment was present in the cortex, it extended throughout the hair length in E animals, but it was limited to the tip of the hair in ee animals.

Pigmentation of nose skin spots due to the action of Ps on B showed the presence of both black and red pigment, but unpigmented skin under white hair had only black and no red pigment. Study of the pigmentation of guinea pig hairs, especially in the albino series, assisted in explaining the interaction of color genes in cattle.

Identical twins in cattle: Their possible value in genetic research—a review, J. L. LUSH (*Jour. Heredity, 28 (1937), No. 12, pp. 415–418, fig. 1*).—A review of the studies on twinning in cattle by Kronacher and Sanders (E. S. R., 77, p. 35).

"Nonesuch" has a birthday—and kittens, H. STERNBERGER (*Jour. Heredity, 28 (1937), No. 9, p. 310, fig. 1*).—The birth of six kittens to the cat with dog-like characteristics, previously described (E. S. R., 77, p. 608) is noted.

Studies on inheritance in Philippine rats (*Mus norvegicus* Erxl.), D. S. RABOR (*Univ. Philippines, Nat. and Appl. Sci. Bul., 5 (1936), No. 4, pp. 373–384*).—A genetic analysis of wild Philippine rats showed them to carry the genes C

for color, C_a for albinism; *A* for agouti, *a* for nonagouti; *B* for black coat; *S* for self, S_i for Irish, S_h for hooding; and *R* and *P* for black eye. The genes were determined by suitable F_2 and backcross matings with albinos.

A reverse mutation in the rat (Mus norvegicus), H. GRÜNEBERG (*Jour. Genet., 35 (1937), No. 2, pp. 177–181*).—The appearance of an agouti rat among the progeny of two nonagouti parents was suggested as due to a reverse mutation.

[**Karakul a dominant mutation in the house mouse**], F. G. CARNOCHAN and L. C. DUNN (*Jour. Heredity, 28 (1937), No. 10, pp. 333, 334*).—This new mutation, in which the hair lies in fluffy waves on the body of the mouse up to 4 weeks of age and has a plush-like appearance in the adult, was found due to the action of a dominant gene. The F_2 progeny from a cross of normals and karakuls consisted of 141 karakuls and 42 normals. Curved and straight vibrissae serve for classification of karakul and normal young at birth.

Tests of the goodness of fit applied to records of Mendelian segregation in mice, H. GRÜNEBERG and J. B. S. HALDANE (*Biometrika, 29 (1937), No. 1–2, pp. 144–153*).—A test for goodness of fit was applied to Mendelian segregations in 1,304 litters of 7,550 mice and showed significant deviations in only 1 of 13 experiments where a recessive lethal gene operated.

A test for uniovular twins in mice, W. L. STEVENS (*Ann. Eugenics, 8 (1937), No. 1, pp. 70–73*).—More than 1,000 mice produced in backcross matings involving six factors and sex were classified into 128 genotypes. From a study of the variance in the litters of different sizes, no evidence was suggested of uniovular twinning. Attention is called to the mouse twins described by W. E. Castle, W. H. Gates, S. C. Reed, and G. D. Snell.[2]

On the manner in which the disposition to carcinoma of the mammary gland is inherited in mice, A. L. HAGEDOORN (*Genetica ['s Gravenhage], 19 (1937), No. 4–5, pp. 431–433*).—The hypothesis pertaining to the influence of extrachromosomal factors on cancer incidence in mice suggested by R. Korteweg[3] is not considered necessary. It is suggested that poor nutrition of the embryos of genetically aberrant mothers is responsible.

The spurious nature of the linkage between length of laying year and sexual maturity in the fowl, I. M. LERNER and L. W. TAYLOR (*Amer. Nat., 71 (1937), No. 737, pp. 617–622, fig. 1*).—Simple, partial, and multiple correlation coefficients between the age at first egg, age at last egg, length of biological laying year, and egg production for 365 days after the first egg and egg production during the biological laying year, calculated at the California Experiment Station on over 600 White Leghorn pullets hatched in 1933 and 1934, showed that significant correlations between production for 365 days or during the biological laying year with age at first egg or age at last egg were reduced to insignificant levels by holding constant, through partial correlations, the length of the laying year. The multiple correlations of production with any two of the three time factors were similar. These results indicate "that the usage of the length of biological laying year as a criterion of persistency is fallacious, that it has not demonstrated linkage between genes for sexual maturity and persistency, and that no evidence for such linkage is obtained when age at last egg is used to measure persistency." It is suggested that in genetic studies either length of biological laying year, alone, or age at first egg and age at last egg together, be used as criteria of the time factor in annual egg production.

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[2] Science, 84 (1936), No. 2191, p. 581.

[3] Genetica ['s Gravenhage], 18 (1936), No. 3–4, pp. 350–371.

The measurement of sexual maturity and persistency, I. M. LERNER and L. W. TAYLOR (*Poultry Sci., 16 (1937), No. 6, pp. 419–421*).—An analysis of the variance of age and date at first egg and age and date at last egg from data on Single Comb White Leghorn pullets, hatched at weekly intervals in 1933 and 1934 and discussed in the study at the University of California reported above, led to the conclusion that age at first egg was a better measure of sexual maturity than date of first egg. Date of last egg was a better measure of persistency than age at last egg, but age at last egg could be used if corrected for hatching date.

Spotting and striping in exhibition classes of Rhode Island Red and New Hampshire baby chicks, J. P. QUINN and T. C. BYERLY (*Poultry Sci., 16 (1937), No. 6, pp. 422–425*).—An analysis at the U. S. D. A. National Agricultural Research Center, Beltsville, Md., of the presence of black spotting and striping in the down color of 650 Rhode Island Red and New Hampshire chicks showed that 24.9 percent of the Rhode Island Reds and 13.3 percent of the New Hampshires carried genes for these conditions. On the other hand, it was found that over 40 percent of the Rhode Island Red chicks from other standard strains carried melanic pigment. As a result of the selection for uniformity of down color in the exhibition birds, the sex ratio of those selected was 142 males to 100 females. In the standard Beltsville flock of unselected chicks, 77.8 percent of the nonspotted, nonstriped chicks were males and 84.9 percent of the black spotted and striped chicks were females. The exhibition classes of New Hampshire chicks carried less black pigment in the down than the Rhode Island Reds.

Henny feathering in the fowl: A fresh interpretation, R. C. PUNNETT (*Jour. Genet., 35 (1937), No. 2, pp. 129–140*).—The author offers a further explanation for hen feathering in the fowl than given by Domm and Lillie (E. S. R., 57, pp. 625, 626), in which there is postulated a dominant gene *H* which produces hen feathering if acted upon by a hormone produced by the testicle or the hypertrophied rudimentary right gonad of ovariectomized females. An ovarian hormone causes henny feathering regardless of whether the birds are *H* or *hh*. It appears that the *H* gene is usually carried by the *Y* chromosome, but cases of transmission of henny feathering from dam to son indicated its attachment to an autosome. Evidence for the hypothesis presented was based on genetic experiments, gonadectomy and implantation, and skin transplantations.

Studies on the creeper fowl.—XI, Castration and length of bones of the appendicular skeleton in normal and creeper fowl, W. LANDAUER (*Anat. Rec., 69 (1937), No. 2, pp. 247–253*).—Continuing this series (E. S. R., 77, p. 178), comparison at the [Connecticut] Storrs Experiment Station of the absolute and relative lengths of the long bones of normal and creeper (full brother) fowls, that were and were not castrated upon removal from the incubator, showed that castration produced no changes in the absolute and relative length of the bones of the extremities in either group.

An inherited kidney abnormality in the domestic fowl, F. P. JEFFREY, F. R. BEAUDETTE, and C. B. HUDSON (*Jour. Heredity, 28 (1937), No. 10, pp. 335–338, figs. 2*).—The occurrence of 14 more or less closely related female birds in four generations with atrophy or complete absence of the left kidney is noted in White Leghorns at the New Jersey Experiment Stations. The condition appeared to be inherited, but the mode of inheritance was not established.

Size inheritance in pigeons, H. WEXELSEN (*Jour. Expt. Zool., 76 (1937), No. 2, pp. 161–186, fig. 1*).—Measurements of the length of the sternum, leg, and beaks of seven breeds of pigeons at the Felleskjøpets Stamsedgård, Hjellum, Norway, showed that the males were slightly but consistently larger than fe-

males. Where the numbers were sufficient, significant but small positive correlations were found between these measurements in three of these breeds and crosses and backcrosses between them. It thus appears that both general and specific size factors were operating, as was observed by Green in the rat (E. S. R., 66, p. 820). In development, the beak completed its growth first and the sternum last. Beak and leg measurements on crosses and backcrosses showed rather wide segregation, and suggested the operation of several but not a very large number of genetic factors. A major recessive factor for short leg seemed to be carried by the frillback pigeon. Suggestions of correlation between size and qualitative factors, such as crest or frill with beak length, were considered due to the direct influence of the qualitative gene on size.

Pigment cells in heterogenous feathers, C. H. DANFORTH (*Anat. Rec.*, 68 (1937), No. 4, pp. 461–468, figs. 2).—From a study of pigment development in the feather follicles of the skin of one breed of fowl grafted on another, there was no evidence that genes of one cell had any direct effect on the cytoplasm of another cell. The range of color in hybrids is due primarily to endogenous factors within the future chromatophores and secondarily to exogenous factors, including hormones.

Capon comb growth-promoting substances ("male hormones") in human urine of males and females of varying ages, E. DINGEMANSE, H. BORCHARDT, and E. LAQUEUR (*Biochem. Jour.*, 31 (1937), No. 4, pp. 500–507).—Analyses of urines of men and women for comb growth-promoting substances showed considerable variations which were associated with sexual activity and age. Urine from women was about equal to that from men.

The hormones of the anterior pituitary, O. RIDDLE (*Ohio Jour. Sci.*, 37 (1937), No. 6, pp. 446–463).—Two groups of hormones of the anterior pituitary were classified. Prolactin and adrenotropic hormones are produced by the eosinophile cells, and the follicle-stimulating and luteinizing hormones by the basophiles. The nature of the thyrotropic hormones was not clear, and both types seemed to have growth-promoting properties. Mention is made of the rapid advances and changes in the understanding of the pituitary hormones.

An antiluteogenic factor in the anterior pituitary, J. FREUD (*Nature* [London], 139 (1937), No. 3525, pp. 880, 881, figs. 3).—Following the suggestion of C. A. Bunde and R. O. Greep,[4] in which regression of corpora lutea was induced by the luteinizing hormone of the pituitary, it was found that luteinization was prevented by the intraperitoneal injection of the pituitary extract, even after administration subcutaneously of pregnancy urine which otherwise induces follicular growth and luteinization.

The female sex hormones, H. O. HATERIUS (*Ohio Jour. Sci.*, 37 (1937), No. 6, pp. 394–407).—The major functions of the female sex hormones are reviewed, and evidence is presented pointing toward the role of the placenta as an organ of internal secretion to substitute for the corpus luteum in maintaining pregnancy. The term "gonadomimetic" is suggested as descriptive of the role of the placenta in maintaining hormonal balance.

The effect of oestrogenic hormones on lactation and on the phosphatase of the blood and milk of the lactating cow, S. J. FOLLEY (*Biochem. Jour.*, 30 (1936), No. 12, pp. 2262–2272, figs. 6).—The administration of oestrogenic hormones (crystalline oestrone and dihydro-follicular-hormone benzoate) to cows at the University of Reading was followed by a temporary decrease in milk yield. Percentage of fat and of solids-not-fat increased. The oestrogen

[4] Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 235–237.

caused a temporary fall in serum calcium and an increase in the serum phosphatase. The oestrogenic hormone is thus considered to inhibit lactation.

Relative duration of action of various esters of oestrone, oestradiol, and oestriol, A. S. PARKES (*Biochem. Jour., 31 (1937), No. 4, pp. 579–585, pl. 1, figs. 3*).—Using the feminization of growing plumage of Brown Leghorn capons as the criterion, duration of the action of various esters of oestrone was tested. The effects of massive doses of the free hormones were only transient, with increasingly prolonged activity resulting from other compounds in the order given—oestrone acetate, oestradiol diacetate, oestradiol monobenzoate, oestrone benzoate, and oestradiol 3-benzoate-17-acetate having the most prolonged activity.

On the composite nature of the estrus phenomenon, S. C. FREED, S. D. MESIROW, and S. SOSKIN (*Endocrinology, 21 (1937), No. 6, pp. 731–734, fig. 1*).—Female rats subjected to X-ray irradiation at 21 days of age developed a type of oestrus which was shown by several laparotomies to be only partially complete. Injections of oestrogenic substances showed that the uteri of these animals were capable of yielding a complete oestrous response. These results show that vaginal cornification does not necessarily indicate normally complete oestrus with ovulation.

Comparison and rate of testicular degeneration in rats after cryptorchidism and hypophysectomy, S. L. LEONARD and J. B. HAMILTON (*Anat. Rec., 68 (1937), No. 4, pp. 497–502, fig. 1*).—A comparison is reported of the rate of testicular degeneration during a 60-day period following cryptorchidism in 25 hypophysectomized and 37 normal rats weighing from 70 to 120 g. Testis degeneration increased rapidly during the first 10 days following cryptorchidism. The maximum difference between the scrotal and abdominal testicles in hypophysectomized rats was attained at about 6 days after the operation. As the movement of the testes into the abdominal cavity follows, rather than produces, the posthypophysectomy degeneration, it appears that cryptorchidism does not play a large part in posthypophysectomy atrophy.

Alterations in the percentage of cell types in the hypoyhysis by gonad transplantation in the rat, C. A. PFEIFFER (*Endocrinology, 21 (1937), No. 6, pp. 812–820, figs. 6*).—It was found that the cell types of the pituitaries of rats could be modified by gonad grafts in animals gonadectomized at birth. The male cell types were produced by grafts of both testes and ovaries in the same animal.

Ovogenesis during sexual maturity: The first stage, mitosis in the germinal epithelium, as shown by the colchicine technique, E. ALLEN and R. N. CREADICK (*Anat. Rec., 69 (1937), No. 2, pp. 191–195, pl. 1*).—By arresting mitosis with colchicine, between 1,000 and 2,000 mitoses per ovary were observed in the germinal epithelium of the mature mouse at oestrus. This leaves little doubt about the proliferation of the germinal epithelium of the mouse ovary during sexual maturity.

Uterine contractions and the transport of sperm in the rat, I. ROSSMAN (*Anat. Rec., 69 (1937), No. 2, pp. 133–149, pls. 2*).—The plastic changes in the uteri of rats containing semen from natural mating were studied after freezing during contraction and relaxation.

The development of the urogenital system in fowls [trans. title], P. GRÜNWALD (*Arch. Entwickl. Mech. Organ., 136 (1937), No. 5, pp. 786–813, figs. 10*).—The early development of the urogenital system in embryos, beginning at the second day of incubation, is described.

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The sex ratio, F. A. E. Crew (*Amer. Nat., 71 (1937), No. 737, pp. 529–559*).—Reasons for differences in the mortality of the sexes are considered.

FIELD CROPS

[Agronomic research in Alabama, 1934–35], E. L. Mayton, J. T. Williamson, J. W. Richardson, J. R. Taylor, Jr., H. B. Tisdale, D. G. Sturkie, E. V. Smith, G. L. Fick, L. M. Ware, R. W. Taylor, and J. F. Duggar (*Alabama Sta. Rpt. 1934–35, pp. 12–14, 20, 21, 25, 26, 27*).—Field crops work (E. S. R., 74, p. 27) reported on briefly dealt with methods of preparing land and ammonium phosphates v. superphosphate for cotton, and factors affecting lint development in cotton; fertilizers for potatoes; soybean variety tests; depth of planting *Crotalaria* seed and the distance to which the seeds are thrown by the pods; time of planting *Lespedeza sericea* and effects of varied soil moisture on numbers of root nodules on winter legumes; and studies of the control of wild onions and nutgrass.

[Agronomic research in Alabama, 1936] E. L. Mayton, D. G. Sturkie, E. V. Smith, and J. F. Duggar (*Alabama Sta. Rpt. 1936, pp. 11, 12, 24, 29, 30*).—Continuing the above, brief reports of progress are given on tests of sources and rates of nitrogen for oats; rotation experiments; scarified v. unscarified *Crotalaria* seed; height of cutting and subsequent seed yields and protein content and depth of planting tests with *Lespedeza sericea*; calcium cyanamide as a herbicide on Bermuda grass lawns (E. S. R., 78, p. 481), and studies on the control of nutgrass and wild onions.

[Field crops research in Oregon] (*Oregon Sta. Bul. 350 (1937), pp. 13–15, 27–29, 39, 53, 54, 60, 63–66, 71–74, figs. 6*).—Progress results and outstanding accomplishments are reported from work with field crops (E. S. R., 73, p. 32) at the station and substations, including breeding work with wheat, barley, tobacco for nicotine, and grasses and legumes for different situations; variety tests with wheat, corn, oats, barley, flax, turnips, mangels, stock carrots, alfalfa, and miscellaneous grasses and legumes; combinations of small grains and field peas for hay and rate of seeding and fertilizer tests with peas and barley for hay; crop rotations; fertilizer tests with alfalfa and sweetclover; isolation of efficient strains of nodule bacteria for alfalfa, clover, and vetch; seed production of grasses; and wheat experiments concerned with response to fertilizers and sulfur, crop residues, rotations, methods and depth and time of plowing, burning v. plowing under stubble, soil moisture and nitrate studies, and rates of seeding. Productive varieties or strains of wheat, barley, oats, corn, rye, alfalfa, clover, sweetclover, grasses, flax, and potatoes developed or introduced by the station are recorded. Several lines of work were in cooperation with the U. S. Department of Agriculture.

Influence of crop rotation and soil treatments upon the yield of crops on Porter's loam soil, C. B. Williams, W. H. Rankin, and S. C. Clapp (*North Carolina Sta. Bul. 315 (1937), pp. 12*).—Wheat, corn, and red clover were grown in 3-yr. rotations including legumes, 2-yr. rotations with and without legumes, and the two grains continuously on Porter silt loam variously fertilized and limed at the Mountain Branch Station, 1918–30, in cooperation with the North Carolina State Department of Agriculture.

A good crop rotation system, as exemplified by the 3- and 2-yr. rotations in which suitable legumes were grown and plowed into the soil for improvement, usually will materially increase crop yields in the rotations when plant food needs are properly met. In all rotations studied with all the major crops, the greatest response in increased yields on this soil came from the use of a complete fertilizer supplemented by limestone. Limestone alone, or supple-

mental to complete fertilizer, increased yields of all crops used in the rotations decidedly more on this soil type than when used on Norfolk sandy loam of the Coastal Plain and somewhat less than on Cecil clay loam soil of the Piedmont.

Wheat fertilized or limed and fertilized and grown in a 2-yr. rotation with corn and without legume cover crops produced slight yield increase over continuous wheat. Wheat yielded better in a 3-yr. than in a 2-yr. rotation with legumes when complete fertilizer alone or supplemented by limestone was properly applied. Even wheat in these rotations did not produce profitable yields until both fertilizer and limestone were added. The average yield of wheat in the 3-yr. rotation without limestone was increased sevenfold by complete fertilizer, and with limestone, complete fertilizer resulted in four times the average yield of wheat per acre obtained without fertilizer. Without rotation including legumes for soil-improving purposes, wheat yields averaged too small to be profitable for any of the four treatments given. Continuous wheat and wheat alternating with corn without legumes did not yield enough to pay for production costs. In the continuous cropping of corn and of wheat, limestone as a supplement to complete fertilizer increased corn yields markedly and wheat yields slightly above that obtained with complete fertilizer alone.

With corn, no fertilizer and complete fertilizer alone were the only treatments giving larger yields in the 3-yr. than in the 2-yr. rotation with legumes. Corn yields from complete fertilizer alone or supplemented by limestone were large enough to be profitable where legumes were omitted from the rotation. The average yield of corn in the 3-yr. rotation without limestone was tripled by complete fertilizer, and with limestone, complete fertilizer brought the average corn yield from 30.4 up to 56.1 bu. per acre.

For red clover in the 3-yr. rotation of corn-soybeans, wheat, and red clover, both limestone and complete fertilizer were essential for satisfactory yields, the fertilizer alone giving a somewhat better increase than limestone alone.

Comparative rates of water loss from soil, turf, and water surfaces, F. A. Welton and J. D. Wilson (*Ohio Sta. Bimo. Bul. 190 (1938), pp. 13–16*).—Continued experiments concerned primarily with water requirements of lawns (E. S. R., 73, p. 603) demonstrated that the rate of water loss from a free water surface exceeded that from bare soil. From Wooster silt loam the rate of water loss was diminished by a peat mulch and by incorporation of manure but was increased by addition of sand. It was less, however, than the rate of loss from muck. From bare soil the rate of water loss was less than that from the same soil types covered with growing grass, except with the sand-loam mixture. Grass cut 3 in. high lost more water than grass cut 1 in. high. The rate of water loss from Kentucky bluegrass and Chewing fescue did not differ greatly.

Indicators of southwestern range conditions, M. W. Talbot (*U. S. Dept. Agr., Farmers' Bul. 1782 (1937), pp. II+35, figs. 36*).—Indicators of range conditions, e. g., signs of a deteriorating range, earmarks of past range damage, and indications of satisfactory use and their significance, are pointed out, and ways of detecting deterioration in its early stages are outlined, with comments on other indicators of proper and improper range use. Important points considered by experienced range judges are evaluated.

[Research with legumes and root nodule bacteria in Wisconsin], E. W. Hof, W. B. Sarles, N. C. Fassett, O. A. Bushnell, R. M. Stern, P. W. Wilson, W. W. Umbreit, and E. B. Fred (*Wisconsin Sta. Bul. 439 (1937), pp. 56–58*).—Progress results are reported on nodule production of good v. poor strains of soybean bacteria, characteristics of nodule bacteria of wild legumes in Wisconsin, new technic in classifying legume bacteria, and methods of nitrogen fixation, especially in varieties of *Melilotus dentata* (E. S. R., 77, p. 623).

Nitrogen-fixing bacteria and legumes, L. T. Leonard (*U. S. Dept. Agr., Farmers' Bul. 1784 (1937), pp. II+14, figs. 10*).—Information is given on the fixation of nitrogen by nodule bacteria; the kinds, sources, and artificial propagation of nodule bacteria; the need for and methods of applying bacteria to seed and soil; testing inoculants; and the fertility value of legumes. This publication supersedes Farmers' Bulletin 1496 (E. S. R., 55, p. 529).

The influence of rate of seeding upon certain plant characters in barley, J. W. Thayer, Jr., and H. C. Rather (*Jour. Amer. Soc. Agron., 29 (1937), No. 9, pp. 754–760*).—In studies involving six seeding rates conducted, 1932–34, at the Michigan Experiment Station with Spartan, Michigan-Two-Row, Glabron, and Wisconsin No. 38 barleys, the number of plants per unit area increased, but tillering, lengths of culm and of head, number of kernels per head, and weight per 1,000 kernels decreased as the rate of seeding rose from 0.5 to 3 bu. per acre. Because varieties differed in this rate of decrease for each character as well as in the characters themselves, some inherent difference existed in the optimum rate. The seeding rate which gave maximum acre yields was a rather wide range and not a single rate, being for Glabron and Wisconsin No. 38 barley from 1 to 2.5 bu., for Michigan-Two-Row from 1.5 to 2.5, and for Spartan from 2 to 3 bu. Increase in seeding rate beyond this optimum range caused so great a reduction in growth characteristics, particularly tillering, head length, and number of kernels per head that acre yields were reduced, and there also was an increased tendency to lodge by the grain sown at the heavier rates. While growth factors were influenced markedly by seasonal environment, the optimum rate of seeding, although varying somewhat with variety, appeared independent of environment.

Illinois corn performance tests, 1937, G. H. Dungan, R. O. Snelling, W. J. Mumm, J. H. Bigger, and A. L. Lang (*Illinois Sta. Bul. 440 (1938), pp. 349–396, fig. 1*).—In the 1937 tests (E. S. R., 76, p. 782) the 332 kinds of corn tested in 21 fields included 30 open-pollinated varieties and 302 hybrids.

The 5 best hybrids surpassed the 5 best open-pollinated varieties by 16.9 in percentage of erect plants and by 13.9 bu. of sound corn per acre in northern Illinois tests; by 30.6 in percentage and 14.5 bu., respectively, in north-central Illinois; by 23.2 in percentage and 14.3 bu. in central Illinois; and by 31.5 in percentage and 15.4 bu. in south-central Illinois. Practically all of the hybrids ranked above the 5 best open-pollinated varieties in general performance in those tests. In southern Illinois, where seasonal conditions and insect numbers were somewhat unfavorable for corn production and where the central Illinois hybrids were not so well adapted, the 5 best hybrids exceeded the 5 best open-pollinated varieties by 17.2 in percentage of erect plants and by 4.5 bu. of sound corn; and in general performance only 39 of the 54 hybrids were superior to the 5 best open-pollinated varieties. The average for all 5 sections of the State showed the 5 best hybrids 23.9 points above the 5 best open-pollinated varieties in percentage of erect plants and 12.5 bu. higher in sound corn.

As in the previous years, the better hybrids demonstrated that their superiority in yield over open-pollinated varieties is greater on highly fertile soils than on less fertile soils.

Effects of superphosphate upon the yield and earliness in maturity of cotton, C. B. Williams, T. S. Buie, and S. V. Stacy (*North Carolina Sta. Bul. 314 (1937), pp. 32, figs. 6*).—The phosphoric acid requirements of cotton grown on four Piedmont and three Coastal Plain soil types of North Carolina were studied, 1930–32, with support by the Superphosphate Institute.

In the Piedmont soil province the yield of seed cotton as an average of eight trials rose from 651 lb. per acre where only nitrogen and potash were applied

to a maximum of 900 lb. per acre when these two nutrients were supplemented by enough phosphoric acid to bring the formula to 4.12-15-3. Effects of phosphoric acid were particularly marked on Davidson clay loam and only slightly less on Georgeville sandy loam. Increases in yield resulting from use of phosphoric acid in experiments on the Coastal Plain soils were less striking, although profitable yield increases ordinarily were secured. Efficiency of all fertilizers, especially phosphoric acid, was found to vary with the season. Increase in the percentage of phosphoric acid resulted in an earlier crop as measured by percentage of total yield secured at first picking. The phosphoric acid content of the fertilizer was found to be of increasing importance with the rate of application, this trend being most marked in experiments in the Piedmont.

A study of the effect of pollen upon the length of cotton fibers, E. H. PRESSLEY (*Arizona Sta. Tech. Bul. 70 (1937), pp. 253–292, figs. 11*).—The reciprocal crosses made in 1931 between strains of Delfos and Red Acala cottons produced seeds whose lint varied very little in length from that of selfed seeds in comparable positions in the same bolls. The hybrid lint from the cross Delfos on Red Acala cotton was the same in length to the nearest $\frac{1}{128}$-in. as comparable self lint from the same mother plants. Selfed and hybrid seeds which bore the lint did not differ significantly in weight. The hybrid lint from the cross Red Acala on Delfos cotton was $\frac{1}{128}$-in. longer than the comparable self lint from the same mother plants. Hybrid seeds were significantly heavier than the selfed seeds. The reciprocal crosses in 1933 between Pima strains and Red Acala produced seeds whose lint length varied only slightly from that of comparable selfed seeds. The hybrid lint from the cross Pima on Red Acala was the same in length to the nearest $\frac{1}{128}$-in. as comparable self lint, while hybrid lint of the cross Red Acala on Pima was $\frac{1}{128}$-in. longer than comparable self lint. This difference, statistically significant in 1931 and possibly so in 1933, was too small to be detected in classing and, it is held, could have no noticeable effect upon spinning qualities of the lint. In 1933, also, hybrid seeds produced by use of pollen from Red Acala did not significantly outweigh comparable selfed seeds, while hybrid seeds produced on Red Acala mother plants by the use of unlike pollen were heavier than comparable selfed seeds. The data revealed no reason for the difference in the effect upon the weight of seeds of the different pollens used.

The lint from a group of relatively heavy selfed seeds from each set of mother plants was longer than that from a comparable group of relatively light selfed seeds from the same mother plants, and the lint from two groups of hybrid seeds from each set of mother plants showed like results. In each case, except with the lint from heavy and light selfed Pima seeds, the difference exceeded any difference in length of lint from comparable selfed and hybrid seeds. Results obtained from the four comparable lots of lint during the 2 yr. show that in all cases where both weight and length of lint were determined, the longer and heavier lint was produced on the same seeds. With one exception the longer and heavier lint was produced on the heavier seeds.

Response of oat varieties to different fertility levels, C. A. LAMB and R. M. SALTER (*Jour. Agr. Res. [U. S.], 55 (1937), No. 10, pp. 785–793, fig. 1*).—Results are reported from the oats crop in the 3-yr. rotation of corn (E. S. R., 73, p. 173), oats, and winter wheat (E. S. R., 76, p. 35) grown at the Ohio Experiment Station and involving 17 varieties grown 4 seasons (1929–32) at 4 fertility levels. Analysis of variance for total yield and for grain yield by seasons individually and together indicated that differences due to variety, to fertility level, and to season were all highly significant. The variety-season interaction was also highly significant, but the variety-fertility level interaction probably

was not significant. It appeared safe to apply results from an oats variety experiment at Wooster to a rather wide range of soil conditions.

Proso or hog millet, J. J. Curtis, J. F. Brandon, and D. W. Robertson (*Colorado Sta. Bul. 438 (1937), pp. 16, figs. 4*).—Variety and planting experiments and seedbed preparations, 1930–36, with proso, made at Akron, Colo., in cooperation with the U. S. Department of Agriculture, are reported, and practical information is given on the crop, its adaptations, and cultural requirements. Proso, an important feed grain crop on the nonirrigated lands of eastern Colorado, is well adapted to the hard lands but less productive than corn on sandy lands. It is grown largely as a short-season, late-sown catch crop and as such may follow or precede any other annual crop satisfactorily.

The experiments indicated that proso should be sown with a grain drill immediately after a rain from about June 15 to July 1 at the rate of about 35 lb. of seed per acre. Turghai, an open-panicled variety with yellowish-brown seed, made the highest average yield, 15.9 bu., and Yellow Manitoba yielded 14.4 bu. Both varieties reached maturity in about 70 days after planting. Varieties tested averaged 15.1 bu. on summer-fallowed land where no failures occurred and 8.4 bu. on Sudan grass stubble where two failures occurred. On summer-fallowed land, Turghai and Yellow Manitoba averaged 20.6 and 19.1 bu., respectively.

A study of the fertilization of rice, J. F. Reed and M. B. Sturgis (*Louisiana Sta. Bul. 292 (1937), pp. 25, figs. 5*).—Fertilizer experiments in pots and greenhouse, 1935–36, involved Blue Rose rice grown on A horizon of rather poor Crowley silty clay loam, receiving various combinations of fertilizers and organic matter as soybean hay. Certain phases (E. S. R., 78, p. 41) and previous work, 1933–34 (E. S. R., 75, p. 308), have been noted.

Large increases in the growth and yield of rice were obtained after the addition of leguminous organic matter. While commercial fertilizers were not as effective, substantial yield increases were obtained from applications including phosphorus. Inorganic nitrogen and potassium were ineffective applied singly or in combination with each other, but were effective with phosphorus. Commercial fertilizers were particularly effective when applied in a localized area around the seed.

Determinations made at certain periods during the growing season of the rice showed that nitrites were never present in the soil in amounts exceeding 3 p. p. m. The nitrates dropped rapidly after flooding and were not detectable at harvest. Ammonia-nitrogen also declined, although not as rapidly as nitrates. All forms of available nitrogen were very low by the end of the growing season. Available phosphorus exhibited a similar rapid decline except in those treatments in which it was applied as ammophos and bonemeal. In the latter cases a much greater content of available phosphorus generally was present at the end of the growing season.

When to cut rice, W. D. Smith and J. W. Jones (*U. S. Dept. Agr. Leaflet 148 (1937), pp. [2]+5*).—Investigations in cooperation with the Arkansas and Texas Experiment Stations, supplemented by surveys in those States and Louisiana, indicated that when a rice crop is harvested at the stage of maturity at which the rice contains from 23 to 28 percent of moisture, good yields per acre of high milling quality will be produced and the rice will have a high percentage of germination. Other practices essential to high milling quality include good seed and proper cultural and irrigation practices, curing the crop not to exceed 14 percent of moisture in the grain before storing or marketing, and threshing without delay after the desired moisture content is attained. Procedure for taking moisture test samples is indicated.

Effect of fertilizers on composition of soybean hay and seed and of crop management on carbon, nitrogen, and reaction of Norfolk sand, J. E. Adams, H. M. Boggs, and E. M. Roller (*U. S. Dept. Agr., Tech. Bul. 586 (1937), pp. 35, figs. 30*).—In a study of the effects of 21 fertilizers of varying ratio on the yield and composition of soybean hay and seed, made at the Sandhill Substation near Columbia in cooperation with the South Carolina Experiment Station, the crop residues were used under three systems of management: (1) The hay was cut when the seed pods were formed but before seed developed, removed, and the stubble turned, (2) hay samples were taken for analysis and the remainder of the crop turned under as a green manure, and (3) seed were allowed to mature, were threshed, and the hay returned to the proper plat.

Largest yields of soybean hay, seed, and oil were obtained by the use of fertilizers containing nitrogen, phosphoric acid, and potash of 3–9–3 analysis. The quality of the hay, as indicated by mineral composition, was influenced appreciably by the fertilizer. The nitrogen content varied from 1.46 to 2.41 percent, P_2O_5 from 0.45 to 0.66, K_2O from 0.66 to 2.28, and CaO from 0.98 to 2.13 percent. The CaO: P_2O_5 ratio varied from 1.61 to 3.07, the 9–3–3 ratio giving a value of about 2:1. Indications were that the CaO and nitrogen contents of the forage are in proportion to the superphosphate applied; that the K_2O content varies with the potassium sulfate and indirectly with superphosphate used; that the P_2O_5 content is a reflection of the potash and phosphate in the fertilizer, with the former dominating; and that the relation of calcium and potassium depends on the level of nitrogen, phosphate, or potash furnished by the fertilizer. Production of oil was favored by mixtures of nitrogen and phosphate, while the highest oil content was obtained with a mixture of nitrogen and potash. The magnesium content of the forage was increased by high-nitrogen fertilizers containing cottonseed meal. The soluble ash, iron and aluminum, Mn_3O_4, and sulfate contents of the hay could be influenced to a variable extent by fertilizers.

Variable but appreciable losses in organic carbon were obtained on 68 plats, while a gain occurred only on the 3–9–3 plat where the mature hay was turned under. Gains of organic nitrogen were more numerous where the mature hay was turned under than for green-manure plats, but where gains were secured for the same fertilizer ratio under both management systems, those for green-manure plats were usually larger. Nitrogen losses were recorded for 18 of 23 plats where only soybean stubble was turned under. The effects of the three crop management systems on the carbon and nitrogen status of the soil depended largely on the composition of plant material turned under. When grown with high-phosphate fertilizers and turned in the succulent stage soybeans were very effective in reducing the carbon: nitrogen ratio, a practice resulting in an accumulation of organic nitrogen.

Effects of the fertilizer ratio and crop management on the pH of the Norfolk sand were quite variable. Turning under mature hay produced with fertilizers reduced the value somewhat more than did unfertilized hay, while the reverse was true where either green manure or stubble was turned under. The least decrease resulted from use of either complete fertilizers or those composed of nitrogen and potash. Certain of the latter combinations increased the pH as compared with the original soil, which had a pH value of from 5.2 to 5.5 when under native cover.

Inspection of agricultural seeds, H. R. Kraybill et al. (*Indiana Sta. Circ. 231 (1937), pp. 110, fig. 1*).—The purity, percentages of germination, and weed seed content, and for legumes the hard seed content, determined in cooperation with the U. S. Department of Agriculture, are tabulated from tests of 1,278 official samples of seed collected from dealers in Indiana during the year ended June 30, 1937. Information on seed control in the State is included.

Control of leafy spurge, Euphorbia esula L., A. L. Bakke (*Iowa Sta. Res. Bul. 222 (1937), pp. 29*).—Herbicidal and cultural treatments, fertilizers, competitive and smother crops, and grazing were studied, 1930–35, near Hawarden in Sioux County to determine their merits in control of leafy spurge (E. S. R., 75, p. 777) on farm lands.

Sodium chlorate proved to be the most effective herbicide for eradication of leafy spurge, the indicated spray formula including sodium chlorate 1 lb., animal glue 4 g, sulfuric acid 3 cc, and water 1 gal. Spraying the chlorate solution on actively growing plants in full foliage resulted in the best kill, with better and more consistent results than when applied dry directly to the soil. The highest percentage of kill was produced when the leafy spurge was sprayed in the latter part of May or when it was about to bloom. A second spray, applied in the latter part of August or before killing frost, usually completed eradication, but for complete elimination 2 yr. are deemed necessary, with any plants remaining treated twice in the second year. Sodium chlorate proved more effective in killing leafy spurge in small grain or millet than where growing alone.

Potasium chlorate was about as effective in eradicating leafy spurge as sodium chlorate, but the residual soil effect was greater. The old Atlacide on the market in 1930–33 apparently was not as effective pound for pound in killing leafy spurge as sodium chlorate. Dilute sulfuric acid and creosote-kerosene killed the tops with little injury to the roots. Heavy applications of ammonium thiocyanate, it is thought, may prove valuable as a herbicide for this weed. Kainite in heavy applications noticeably reduced the number of leafy spurge plants.

Plowing leafy spurge deeply (7–8 in.) in the fall and again in the spring materially reduced the amount of the weed. Fallowing for 2 yr. by cultivating 30 times each year from June 1 until October 1 completely destroyed it. Leafy spurge in corn was not reduced by four cultivations, and surface cultivation in corn following regular cultivation did not prove an effective eradication procedure. Well-rotted manure (3 tons to the square rod) was effective against leafy spurge, but straw had no effect.

Millet, sorghum, and soybeans drilled in heavily about June 15 after the ground had been plowed and fallowed proved to be good crops for infested areas. Reduction was greater if the land was plowed the preceding fall and again the following spring and cultivated until the smother crop was planted. A program of eradication with growing competitive crops may be shortened by giving the weed one application of sodium chlorate the previous fall, shortly before killing frost. Alfalfa did not compete successfully with leafy spurge, but was tolerant to sodium chlorate and might be used on ground where the weed has been killed with sodium chlorate or Atlacide. Barley was sensitive to sodium chlorate in the soil, and soybeans were less tolerant than barley or oats.

Leafy spurge (and bindweed) was not controlled by grazing with sheep and hogs. It was shown that when leafy spurge becomes established it cannot be eradicated through practices generally given corn or small grain crops.

The chemical control of St. Johnswort, R. N. Raynor (*California Sta. Bul. 615 (1937), pp. 38*).—Livestock growers' dissatisfaction with chlorate sprays and the continued spread of St. Johnswort led to the reopening and extending of the investigations (E. S. R., 64, p. 737) on chemical control. Plat tests located on several solidly infested areas near Fort Seward and Blocksburg in southeastern Humboldt County were conducted over 2 yr. with 16 chemicals and 6 mixtures. Studies to determine the best rate, season, and method of application were made with herbicides that preliminary trials showed to be most effective.

A 5 percent solution of sulfuric acid, the cheapest effective contact spray tested, when applied at the rate of 3 gal. per square rod killed the tops of St. Johnswort down to the root crown at all stages between bud and green seed. Translocation of sodium arsenite sprays occurred to a limited extent in St. Johnswort, but this method did not kill a percentage of plants high enough to constitute satisfactory control. Soil treatments were the most reliable and most effective type of chemical application, and sodium chlorate, borax, and mixtures of borax and sodium chlorate were effective applied either as sprays or as the dry salt. The borate ores—colemanite and Kramer ore—were effective when applied dry, alone or combined with sodium chlorate. Sodium arsenite sprays killed existing plants and also prevented seedling establishment for some time. Mixtures of dry arsenic trioxide and sodium chlorate effectively prevented reinfestation by seedlings and killed existing plants.

The treatments most satisfactory in cost and ease of application were mixtures of 4 lb. of either colemanite or Kramer ore with 0.5 lb. of chlorate per square rod, equivalent to 720 lb. of mixture per acre, costing around $14.40. At this rate the dry materials are easily distributed by hand, and in such scattered infestations as are feasible to treat, this method should cost considerably less than spraying methods currently used in treating with sodium chlorate. Although slightly more expensive than straight dry sodium chlorate, the mixtures are applied more easily and have a greater residual effect against seedlings of St. Johnswort and lesser fire hazards. "Although not confirmed by test, it is reasonable to presume that the material may be applied on range land in the presence of livestock without danger of poisoning."

HORTICULTURE

[**Horticultural investigations carried on by the Alabama Station, 1934–35 and 1936**] (*Alabama Sta. Rpts. 1934–35, pp. 22, 23–25, 26, fig. 1; 1936, pp. 27, 28, 29*).—In the report for 1934–35 are discussed the following studies: Heating for the protection of Satsuma orange trees, by L. L. English; response of early truck crops to soil improvement methods involving summer legumes, and influence of different fertilizer materials on the earliness and yield of snap beans, both by L. M. Ware; and the use of fertilizers on black locust planted for soil erosion purposes, by D. J. Weddell.

The report for 1936 deals with the relative importance of soil moisture and nitrates on the growth of young pecan trees, by Ware; variety and cultural tests of eggplant, okra, and peppers, by C. L. Isbell; and the influence of additional illumination and shading on the earliness of China asters, by E. W. McElwee.

[**Horticultural investigations by the Oregon Station**] (*Oregon Sta. Bul. 350 (1937), pp. 15, 16, 17, 29, 30, 31, 34, 35, 58–60, 62, 63, 66, figs. 3*).—Among investigations the progress of which is discussed in this report are the development of chemically treated wraps for pears; the design of effective fruit driers for prunes; the development of blight-resistant pear stocks and varieties; pollination requirements of the sweet cherry; the production of pyrethrum as a source of insecticides; the pollination of the pear; the effect of gas emanated from fruits on ripening and keeping quality; the influence of irrigation on small fruits; variety trials with tree fruits and grapes; propagation studies with fruits and ornamentals; transportation of pears to distant markets; marketing of pears; the testing of sweet corn hybrids; the removal of spray residues; fertilizers for apple trees; pruning and thinning of apples; variety tests with apples, pears, peaches, and small fruits; response of pear trees

to soil moisture supply and pruning; alternate-year bearing of pears; water penetration in heavy soils used for pear growing; and the comparative yield of canning crop peas.

Nutrient solution methods of greenhouse crop production, R. B. Withrow and J. P. Biebel (*Indiana Sta. Circ. 232 (1937), pp. 16, figs. 3*).—Stating that the nutrient solution method of growing plants is not entirely new and in essence is not basically different from growing plants in soil, the authors discuss sand and water culture practices. A subirrigation method of supplying nutrient solutions, the general idea for which, the authors state, was conceived independently during the same year by the New Jersey and Indiana Experiment Stations, is outlined in considerable detail with diagrams and specifications. The composition of nutrient solutions is discussed, with a few formulas suggested.

Green peas for Illinois markets, J. W. Lloyd (*Illinois Sta. Circ. 483 (1938), pp. 8, fig. 1*).—In this pamphlet there is presented information relating to consumer preferences; the comparative qualities of wrinkled and smooth-seeded peas; desirable time for planting; varieties recommended for Illinois with notes on the height of plants, size of pods, etc.; and general cultural requirements.

A third experience in producing stock effects with ring grafts, R. H. Roberts (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 296, 297, fig. 1*).—In this third paper (E. S. R., 77, p. 45) upon studies at the University of Wisconsin, the author presents additional evidence to show that the variety of the ring exerts an effect on the subsequent growth of the scion. A ring which gives good growth on one variety may give poor growth on another. The new xylem formed under Hopa rings (a variety with red wood and red bark) was red, indicating its origin in the cambium of the bark. Where the Hopa bark did not entirely surround the stem, a gap of tissue from the stock formed between the areas of red-colored xylem.

A preliminary report on asphalt emulsions used in grafting, H. A. Cardinell (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 285*).—At the Michigan Experiment Station, a total of 18 mixtures, 10 modifications of brush wax formulas, and 8 asphaltic preparations were tested on 1,741 cleft-grafted apple scions. The average of 4 grafting wax formulas using resin as a base was 94 percent successful; of 4 formulas using abietic acid as a base, 85 percent; and of 6 asphaltic emulsions, 88 percent. All were satisfactory from the standpoint of actual practice.

The relation between the size of apple seedling rootstock and size of orchard tree, K. D. Brase and H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 298–304, figs. 3*).—Following an earlier paper (E. S. R., 66, p. 434), which dealt with the effect of the size of the seedling on the growth of the budling and of the 2-year-old nursery tree, the present paper discusses studies in which 2-year-old Early McIntosh trees, set 6×8 ft., were carefully measured as to trunk girth increment. The results showed that the original nursery size of the seedling rootstock played little, if any, part in the subsequent development of the trees. Method of budding, time of budding, and condition of the seedling stock at the time of budding appeared to have considerable effect on the development of the tree for a considerable time in the nursery row and after transplanting to the orchard. Retransplanting to a new site after some time in the orchard apparently resulted in an equalization of the growth of the smaller and larger trees and helped to mask any possible differences in the inherent vigor of the rootstocks.

An unusual leaf characteristic which is useful in identifying the Virginia Crab apple stock, T. J. Maney and H. H. Plagge (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 305, 306, fig. 1*).—Examination of the leaves of Virginia Crab rootstocks growing in the greenhouse of the Iowa Experiment Station revealed an accumulation of small, yellow, oval-shaped wax globules along the main veins. This deposition was not observed on other varieties and is believed characteristic of the Virginia Crab, but is found only during the early stages of growth and under greenhouse conditions with temperatures below 60° or 70° F.

A method for appraising apple clonal stock material in the nursery, F. B. Lincoln (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 307–313, figs. 6*).—The author discusses an experimental procedure used at the University of Maryland for determining the potential usefulness of rootstock materials. The successive steps include (1) budding on domestic seedlings to obtain a conception of their compatibility with domestic apples and capacity to produce dry matter, (2) a determination by the wire girdle method of ability to root from the scion, (3) observations on the stock budlings for general characteristics, (4) budding of stocks with horticultural varieties, (5) the effect of the stocks on root development of the rootstocks, and (6) trench layering to test the capacity of the new stocks to reproduce by this method. A total of 185 clons for stock possibilities were under trial with the above procedure.

Comparison of root development of clonal and seedling understocks with apple varieties under orchard conditions, I. C. Haut and A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 314–318, figs. 3*).—Studies by the University of Maryland on the comparative root development of a 7-year-old Delicious tree on a clonal stock, Vermont 323, and on French Crab, and also of 5-year-old Starking and Yellow Newtown trees on clonal Spy 227 and on French Crab, showed noteworthy differences. The Delicious tree on Vermont 323 had the greater root weight in almost every soil zone, regardless of size classification, and the roots penetrated more deeply and spread farther laterally. However, the Delicious on French Crab had the greater total weight of roots in relation to top. In the case of Starking and Yellow Newtown, trees on Spy 227 made the greater weight of roots, but the trees on French Crab had the greater weight of roots in ratio to the tops and, contrary to Delicious, had the more fibrous root systems. The larger size of tops in all cases on clonal rooted trees could therefore not be explained by the root systems alone.

The effect of pruning on yields of own-rooted and seedling-rooted apple trees, F. S. Lagassé (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 319–322*).—In this further contribution on a rootstock project conducted by the Delaware Experiment Station (E. S. R., 76, p. 793), the author reports that pruning reduced yield or delayed fruiting in all trees regardless of whether they were growing on their own roots or on French Crab roots. The data suggested that pruning had a greater reducing effect in the French Crab rooted trees. In 13 of 19 cases the coefficient of variability for yields was higher in the case of the pruned tree, indicating that pruning tends to increase variability. In the unpruned trees, seedling rooted trees were less variable in yield in 9 of 11 instances, but significantly so in only 2 cases.

Etiolation as a method of rooting apple variety stem cuttings, F. E. Gardner (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 323–329, figs. 4*).—Studies at the U. S. D. A. National Agricultural Research Center, Beltsville, Md., showed that etiolation is an important factor in the production of roots from stem tissues of the apple. A piece of black insulating tape, wrapped four or five times around

a young shoot, resulted in a high percentage of rooting in the McIntosh, but only when leaf bud scars were covered, since the new roots developed from the bud axils. Covering young McIntosh trees with black waterproof boxes in early spring greatly increased the success of the taping process. Marked differences were noted between varieties in their response to etiolation, but no variety failed to root to some extent. Apparently, root primordia are preformed in the etiolated areas during early growth. The place of occurrence of primordia differed among varieties. Tracing the course of rooting in McIntosh cuttings taken at 2-week intervals throughout the fall and winter months, beginning August 15, there was noted a progressive decline in rooting capacity until early spring. Attempts to apply the etiolation procedure to pears met with indifferent success, and with sweet and sour cherries no success at all. The physiological aspects are briefly discussed, with the suggestion that possibly absence of light brings about a temporary accumulation of growth-promoting substances in the etiolated region due to some anatomical abnormality.

Certain chemical and physical changes produced in Kieffer pears during ripening and storage, J. M. Lutz and C. W. Culpepper (*U. S. Dept. Agr., Tech. Bul. 590 (1937), pp. 38, figs. 12*).—Studies with the Kieffer pear, a variety of poor flavor, tough and woody texture, and abundance of sclerenchyma cells, indicated that material improvement in quality was possible if the fruits were picked when dropping had started appreciably and stored at from 60° to 65° F. Higher temperatures were not satisfactory and were accompanied by loss in weight and increase in decay. Storage at a uniform temperature of 60° was more effective than a temperature alternating at 24-hr. intervals between 50° and 70°. Pears were held at 32° for as long as from 90 to 120 days and subsequently ripened at 60° to an agreeable texture and flavor. The changes in texture at 60° were associated with the conversion of protopectin to pectin, but the changes in sugars, acids, and solids were too small to influence the quality greatly. Respiration rate was at a maximum at from 60° to 65°, the temperature most favorable to the development of quality. Catalase activity was generally higher in fruits that had been held at 60° than in those held at higher temperatures. Ethylene failed to influence the rate of softening of Kieffer pears at 80°. Time of harvesting had only a slight effect on the quality of the fruit and was greatly overshadowed by the influence of ripening temperature subsequent to harvest. Quality and sugar content were only slightly influenced by the number of leaves per fruit under ordinary conditions, but severe defoliation resulted in low sugar content and only mediocre quality. The quantity of stone cells appeared to be much less in properly ripened than in unripened fruit.

Symptoms of some mineral deficiencies in one-year Elberta peach trees, J. H. Weinberger and F. P. Cullinan (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 249–254, figs. 2*).—At the U. S. D. A. National Agricultural Research Center, Beltsville, Md., trees in sand culture were supplied with nutrient cultures lacking, respectively, in nitrogen, phosphorus, potassium, calcium, magnesium, iron, sulfur, manganese, and boron. Trees supplied with a complete solution made very satisfactory growth and developed fine color. The effects of the various deficiencies are described in detail, and, for the most part, were distinctive. However, the chlorosis of leaves on iron-deficient plants was very similar to that resulting from magnesium deficiency, but in defoliation the iron-minus trees dropped their younger leaves first as contrasted with older leaves first in the magnesium-minus cultures. Manganese-deficiency symptoms were slow to appear, but late in the test the leaves gradually assumed a dull yellowish-green color differing from that in any of the other cultures. A lack of boron produced rapid and severe effects, in which dark green, water-soaked spots, exud-

ing sap, appeared on every growing tip about 1 in. from the end, defoliation occurred early, and the roots were poorly developed, consisting chiefly of fibrous roots. The omission of either copper or zinc had no observable effect on the trees.

Evaluation of varieties of peaches in the Northeast, compiled by M. A. BLAKE ET AL. (*New Hampshire Sta. Circ. 54 (1937), pp. 8; also in N. J. State Hort. Soc. News, 18 (1937), No. 6, pp. 945–947, 950*).—Herein is presented, with commentary notes, a list of peach varieties given the combined recommendation of a committee of pomologists representing 11 of the Northeastern States. Elberta is presented as the outstanding commercial variety, with Golden Jubilee second.

Growth study of the apricot fruit.—III, The effect of girdling, O. LILLELAND and J. G. BROWN (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 264–271, figs. 4*).—This, the third paper (E. S. R., 76, p. 629) of a series from the California Experiment Station at Davis, presents evidence that the normal growth cycle of the apricot fruit—(1) rapid increment, (2) retarded rate, and (3) accelerated rate to maturity—may be modified by girdling the fruiting branch just following the close of the initial rapid period. The results suggest that if the girdling had been done between 7 and 10 days prior to the termination of the first period, the slowing down in the second period might have been eliminated. Period 3 began one week earlier in the girdled fruits. Drastic thinning of the fruit on a tree, thereby increasing greatly the leaf surface per fruit, had no effect on the growth cycle, indicating that girdling has an effect that cannot be duplicated by merely increasing leaf area per fruit. An examination of the embryos of fruit on girdled limbs showed no acceleration in development in the second period comparable to that noted in the fruit tissue. Girdled apricots ripened approximately 14 days earlier in 1935 and 1936.

Some results on washing cherries for the removal of spray residue, M. B. HOFFMAN (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 275–278*).—Stating that the usual washing treatments prior to canning or cold packing remove spray residues adequately, the author discusses studies carried on by Cornell University with cherries designed for the fresh fruit trade. Neither 2 nor 3 min. of agitation in a 0.5 percent solution of hydrochloric acid removed sufficient residue from Montmorency and English Morello cherries, but a slightly stronger solution was effective when used for Schmidt and Windsor cherries carrying a lower initial residue load. A 0.75 percent hydrochloric acid solution caused some cracking of sweet cherries and a 1 percent solution was altogether unsatisfactory, due to cracking, reduction in the bright finish, and in some cases failure to reduce residues sufficiently. The addition of wetting agents to hydrochloric acid solutions improved residue removal but added to cracking injury. Acetic acid washes proved highly effective, and during the 1936 harvest season 2 tons of Schmidt and 0.5 ton of English Morello cherries, carrying a high load of residues, were effectively washed in a 1 percent acetic acid bath plus a wetting agent. Certain alkaline materials, such as soda-ash, sodium silicate, and trisodium phosphate, appeared promising.

Growing fruit for home use, V. W. KELLEY (*Illinois Sta. Circ. 482 (1937), pp. 40, figs. 31*).—In this circular of general information the author presents data on the planning of a home fruit garden, securing of proper planting stock, planting methods, handling of the soil, intercropping among young trees, irrigation of small fruits, pruning practices, spraying requirements, control of insect and fungus pests, and miscellaneous useful information.

Blackberry and dewberry varieties in east Texas, H. F. MORRIS (*Texas Sta. Bul. 558 (1938), pp. 30, figs. 4*).—Based on the results of a 5-yr. test at the Nacogdoches Substation of 72 varieties and selections of blackberries and dew-

berries, the author reports that the maximum yields were secured with early to midseason varieties of the trailing type. Lawton was the only upright variety showing value. From a commercial viewpoint, Austin and Lucretia were the best early varieties, and Crandall Early, Dallas, Early Wonder, Lawton, and Young the best midseason kinds. All late varieties proved highly susceptible to disease. Young and Boysen were outstanding for size and quality of their fruits. None of the red and black raspberries tested proved adapted to the region.

Some evidence relating to the downward movement of photosynthate in fruiting canes of the red raspberry, W. G. Brierley and R. H. Landon (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 377–380*).—Having noted in the summer of 1933 that girdled canes of Latham grew and fruited normally but showed some callus formation and enlargement near the upper margins of the girdled area, the Minnesota Experiment Station repeated the experiment in 1935. Latham and Chief fruiting canes at the time of bud swelling were girdled at the base and the wounds covered with grafting wax. Growth and fruiting proceeded normally. Microchemical examination of cross sections of the canes showed no evidence of starch in any instance, and the sugar present appeared to be either glucose or reducing sugars. In vigorous Latham canes with slight development of callus, there was a somewhat greater concentration of sugars in the girdled than in the nongirdled canes. In Chief canes with no callus development, there was no detectable increase in sugars. Similar studies were carried on in 1936.

It was evident that strong canes with large leaf areas may produce a surplus of sugars after the growth needs have been met. Weakened canes or those with sparse foliage did not usually show any sugar accumulation above the girdles. Callus formation and sugar formation in girdled canes occurred at the time of the most rapid growth in the new canes, indicating no harmful competition between fruiting and new canes, but, on the contrary, a mutual helpfulness.

The relation of catalase activity to growth in the Latham raspberry, W. G. Brierley and R. H. Landon (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 381–384*).—Determinations at the Minnesota Experiment Station of catalase activity in new and fruiting canes of the Latham red raspberry at several stages of development showed a decline in catalase activity in the leaves and tips of new canes during the period of most rapid growth, followed by an increase in activity as the canes approached maturity. On the other hand, there was no increase in the fruiting canes at the end of the season. In 1934, probably because of a severe drought, the young canes did not show as clearly the expected reciprocal of catalase activity and growth. Both the new and fruiting canes were normally below vigor.

Further studies of the absorption of water by red raspberry foliage, and some evidence relative to the movement of water within the plant, W. G. Brierley (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 385–388*).—Contrary to earlier studies (E. S. R., 75, p. 486), the Minnesota Experiment Station found that, in the case of Latham raspberry plants growing in the field with waterproof paper on the soil to prevent the entrance of rainfall, spraying the foliage with water did not increase the amount of water in the plants. Working with Latham plants in metal tubs and permitting them to dry to the wilting stage, spraying with water resulted in a restoration of turgidity in about 3 hr. When the fruiting canes were covered with waterproof paper, the leaves of the young canes absorbed sufficient water to restore themselves and the fruiting canes. Where the young canes were covered, the fruiting canes did not

absorb water as rapidly as did the young canes. Complete immersion of either the young or the fruiting canes gave further evidence that the fruiting canes are not as effective in water absorption or conduction. The downward movement of water in the canes was shown by splitting the canes upward from the base and watching the effect on a lateral issuing from the split-off section. Where one-fourth, one-third, and one-half of the stem tissue was removed at the base and the wounds waxed, the canes grew apparently as well as the untreated until the middle of July, when all the fruiting canes were suffering. Then one-third of the stems from which one-half of the basal tissue had been removed showed the greatest drying. Measurements of the tracheae showed length to decrease from the base of the canes upward.

The influence of spacing strawberry plants on leaf development, E. P. Christopher (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 341–345, figs. 3*).—In experiments at the Rhode Island Experiment Station with Howard 17 and Dorsett plants, it was noted that spaced plants developed a much larger number of leaves than did those in matted beds. With mother plants placed 24 in. apart in the row, a marked increase in leaf number in the young runner plants was noted with each increase in runner spacing. The greater the distance between mother plants, the longer the time required to secure all the necessary runners at any given spacing distance. Determinations of leaf area per plant showed that the more runners per mother plant, the smaller the leaf area per plant. The matted row plants had not only the smallest number of leaves but the smallest average leaf size and the smallest leaf area per plant. In essence, the production of large, well-developed plants capable of large yields was favored by spacing.

***The response of strawberries to irrigation in a dry harvest season*, F. E. Staebner** (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 349–354, figs. 6*).—In this study, conducted cooperatively by the U. S. Department of Agriculture and the University of Maryland in a commercial berry field on the Eastern Shore of Maryland with six varieties—Blakemore, Catskill, Dorsett, Fairfax, Premier, and Big Joe—fine responses in yield were obtained from irrigation during the extremely dry harvest period. The drought became so intense that it was necessary to water the control plants to save them. Determination of soil moisture, made on samples collected from the various nonirrigated plats, showed that moisture under the plants spaced 11 in. was as low as under matted plats, indicating that in a dry period the spaced plants take up all the available moisture. However, the best moisture conditions were found under irrigation where the plants were spaced 11 in. and the maximum water was applied. Under the conditions of the experiment the maximum beneficial amount of water was not reached in any plat, possibly because irrigation was not begun early enough or possibly because excessive transpiration resulted from the hot, dry winds.

Spacing studies on several strawberry varieties with and without irrigation, A. L. Schrader and I. C. Haut (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 355–359, figs. 2*).—Data taken by the University of Maryland in connection with the foregoing study showed from 1,500 to 2,250 runners, depending on variety in the matted plats, whereas 192 and 120 plants made a full stand on the 7- and 11-in. spacing plats, respectively. Calculated on an acre basis, the matted plats had from 370,000 to 621,000 runner plants, the 7-in. plats 61,000, and the 11-in. 33,000. Yield data in 1936 showed markedly better results for the spaced plats over the matted plats receiving the same irrigation treatments. Except under very low moisture conditions, there was no significant difference between 7- and 11-in. spacings. Increased yields from spacing were largely due

to the increased number of larger berries, although under conditions of limited moisture there was an actual increase in numbers. Under comparable treatments, Dorsett and Fairfax showed less actual wilting of plants than did Blakemore or Howard 17 (Premier), with Catskill intermediate. Spacing made irrigation much more effective.

Seasonal distribution of yield and size variation for some everbearing strawberry varieties, W. H. Childs (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 364–367, figs. 2*).—Of seven varieties of everbearing strawberries compared by the West Virginia Experiment Station, the Empire All Red proved so inferior in yield as to be discarded at once. Of the remaining varieties, Mastodon produced the largest berries over most of the season. Champion produced consistently smaller berries than the others. Lucky Strike, Mastodon, and Wayzata had two peaks of production, one in August and one in September. Rainfall influenced yields by accentuating or lessening normal trends.

The effect of shortening the length of day on flower-bud differentiation and on the chemical composition of strawberry plants grown during the normal growing season, E. W. Greve (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 368–371, fig. 1*).—Beginning in early summer, young Howard 17 (Premier) plants, after 15 days or more of subjection to 11-hr. day lengths were analyzed at the University of Maryland for total nitrogen, total carbohydrates, and various fractions thereof. The first differentiation, as indicated by sectioned buds, occurred in plants collected June 22 and subjected to an 11-hr. photoperiod from July 9 to August 13. In contrast, plants under normal days showed no definite differentiation until September 11. Dry weight of tops and roots was higher in the 11-hr. plants, but total nitrogen was higher in both roots and tops of the normal-day plants. Total carbohydrates of the tops were higher in every case in the short-day plants and in all but one lot in the roots. In every case the carbohydrate-nitrogen ratio was higher in the 11-hr. plants, and the longer the treatment the more pronounced the difference. Differences in the several fractions were less consistent and less marked than the totals. Flower-bud formation was apparently dependent upon the nutritional condition of the plant, and this, in turn, on the length of the day.

Muscadine grapes, C. Dearing (*U. S. Dept. Agr., Farmers' Bul. 1785 (1938), pp. II+37, figs. 27*).—This contains general information relating to propagation, soil and fertilizer requirements, pollination, training and pruning, harvesting, uses of the fruit, control of various pests, and notes on the more important varieties.

Propagating citrus by twig grafting, F. F. Halma and E. R. Eggers (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 289, 290, figs. 2*).—Combined grafts of Eureka lemon, sweet orange, and sour orange were accomplished successfully by the California Experiment Station at Riverside, and the resulting triple grafts rooted to the extent of 80 percent. In another case, four stem cuttings were combined and rooted. The usefulness of such technic in studies of stock-scion relationships is stressed.

Rooting of papaya cuttings, H. P. Traub and L. C. Marshall (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 291–294*).—The application of "bottom heat" was found highly beneficial in stimulating rooting response in papaya cuttings. Of four types of cuttings—(1) the entire branch including the natural swelling at the basal end, (2) distal cuttings from branches, (3) the median portion, and (4) the basal portion of the branch including the natural swelling—all gave good results in a solar frame. Treating the base of cuttings for 42 hr. in a 1–10,000 solution of β-indoleacetic acid increased the percentage of success and the quantity of roots per cutting. No significant differences due to variety or

sex were noted. The best size of cuttings for convenient handling ranged from 0.5 to 1 in. in diameter. No important difficulty was met in transplanting the rooted cuttings.

Nursery propagation and topworking of the macadamia, J. H. BEAUMONT and R. H. MOLTZAU (*Hawaii Sta. Circ. 13 (1937), pp. 28, figs. 8*).—Herein is presented general information on propagation, grafting, growing of nursery stock, methods of planting, top-working of older trees, etc.

FORESTRY

Careers in forestry (*U. S. Dept. Agr., Misc. Pub. 249 (1938), pp. 16*).—This publication is a revision of and supersedes an earlier unnumbered circular issued in 1927 (E. S. R., 57, p. 739).

Forest soil problems in New England, H. A. LUNT (*Ecology, 19 (1938), No. 1, pp. 50–56, fig. 1*).—Stating that the entire New England area was glaciated and that the glacial deposits gave rise to soils of complex character, the author differentiates three main forest regions—(1) the oak of Connecticut and Rhode Island, (2) the white pine of most of Massachusetts, the Connecticut River Valley and Lake Champlain sections of Vermont, southern New Hampshire, and southwestern Maine, and (3) the spruce and northern hardwood region of northern Vermont, New Hampshire, and Maine. A discussion is given of the distinctive features of the soil of these forest areas with the suggestion that the rate of growth and relatively poor quality of much of the timber is, on the whole, more a problem of forestry management than of unfavorable soils.

Density and rate of growth of the wood of spruce and balsam in eastern Canada, J. D. HALE and J. B. PRINCE (*Pulp and Paper Mag. Canada, 39 (1938), No. 2, pp. 138–142*).—Based on studies of material from approximately 1,700 trees collected from nearly 70 stands of 3 general types—(1) softwood with balsam and white spruce predominating, (2) black spruce predominating, and (3) a mixture of softwoods and hardwoods—the authors report that the wood of each species shows considerable range in mean density in the different stands. The average densities for balsam, white spruce, red spruce, and black spruce were, respectively, 0.33, 0.368, 0.382, and 0.433. In general, density decreased with increased width of the growth rings. The possibility of making a reasonably accurate prediction of density by examination of an adequate number of increment borings is suggested, and the desirability of arranging test data by diameter classes is indicated. It is considered possible to estimate the average density for stands of black and white spruces of the types reported by measurement of the mean rate of growth with a probable error not greater than 2.5 percent.

The effect of vegetation on the growth of longleaf pine seedlings, L. J. PESSIN (*Ecol. Monog., 8 (1938), No. 1, pp. 115–149, figs. 10*).—Studies conducted by the U. S. D. A. Southern Forest Experiment Station near Bogalusa, La., in an area occupied by 12-year-old longleaf pine seedlings which were still in the grass at the beginning of the investigation in 1932 showed that the removal of all herbaceous cover, such as grass, shrubs, and other tree species, increased not only height growth but general vigor. The average evaporation rate and the average maximum temperature at the soil surface were considerably higher in the denuded plats than in the grass plats. The seedling growth in the denuded plats showed a phenomenal increase in the 3 yr. succeeding releases. Where the seedling pines were thinned in addition to denudation, the greater the thinning the greater the increase in the growth of the remaining trees. In the

denuded plats, seedlings as low as 30 cm in height began to produce ovulate cones, while the other trees 20 times as tall and of the same age were not bearing. Observations on root development in denuded areas thinned to 185 and 24 seedlings per milacre showed that thinning not only stimulates top growth but also root development.

Ecological changes due to thinning jack pine, T. S. Hansen (*Minnesota Sta. Tech. Bul. 124 (1937), pp. 77, figs. 19*).—Stating that in northern Minnesota it is not unusual for jack pine, *Pinus banksiana*, to attain a height of from 80 to 100 ft., with diameters of from 12 to 16 in., the author discusses the results of studies in three areas, two thinned to different degrees and one unthinned. The stand in which the plats were located was 27 yr. old at the time of thinning and after the initial thinning the heavily and the moderately thinned plats had 768 and 1,105 trees per acre, respectively, as compared with 3,040 trees per acre on the unthinned control plat. The volume increase was greater on the heavily thinned plat when all the trees were considered, but the advantage at the end of the first 5-yr. period was not significant. At the end of the second period the difference was significant. The intermediate and codominant crown classes showed the greatest response to thinning. The loss in number of trees on the control plat occurred almost entirely in the 1- and 2-in. diameter classes.

The mean air temperature was significantly lower in the crowns in the heavily thinned stand and higher at the soil surface. The difference in air temperature between the moderately thinned and unthinned stands was not statistically significant. More precipitation reached the soil in the thinned than in the unthinned stands, yet moisture in the different soil layers was apparently very little affected by thinning and showed considerable variation among plats from year to year. Relative humidity was higher in the moderately thinned stand with the difference highly significant at the soil surface. In the heavily thinned stand, the rate of evaporation was higher, with the difference highly significant at the surface. Soil temperatures were significantly higher in the thinned plats at all depths, and a temperature that would permit root development was reached 10 days earlier than in the unthinned. There was apparently no change in the acidity of the humus due to thinning treatments, but the forest floor of the heavily thinned plat appeared to be in much better condition. On the whole, the most significant changes due to thinning occurred in soil temperatures.

The effect of fires of different frequencies on the survival of different species of pines, D. J. Weddell and L. M. Ware (*Alabama Sta. Rpt. 1936, pp. 28, 29*).—Much better survival was secured in young loblolly, slash, longleaf, and shortleaf pines when burned every 2 yr. than when burned annually. Of the four species, longleaf was the most resistant to fire.

Causes of mortality in coniferous plantations, W. F. McCulloch (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 86–91, figs. 2*).—Studies in red pine, white pine, and Norway spruce plantings at the Dunbar Forest Experiment Station near Sault Ste. Marie, Mich., indicated that of the 100 percent loss due to all causes, 51.7 percent was due to inferior sites and 26 percent to poor planting, with the balance distributed among various factors such as rabbit and heat injury, mechanical injury, snow damage, insect damage, and undetermined factors. Of a total of 53,700 trees planted, there survived about 25,000.

The effect of deer browsing on certain western Adirondack forest types, J. Pearce (*Roosevelt Wildlife Bul. [Syracuse Univ.], 7 (1937), No. 1, pp. 61, pl. 1, figs. 25*).—Among other interesting observations were that deer in the western Adirondack region browse woody growth during the dormant season only. When in winter yards, deer feed on practically every woody plant except spruce. Because of this fact deer may enable red spruce to assume

dominance, particularly in drained swamp areas where red maple and yellow birch and other hardwoods ordinarily outgrow the spruce. Red maple, yellow birch, mountain holly (*Nemopanthus mucronatus*), and witch hobble (*V. alnifolium*) were especially favorite foods of the deer during the browsing period. On the other hand, red maple, yellow birch, mountain holly, and wild raisin (*Viburnum cassinoides*) were particularly resistant to repeated browsing. Witch hobble was the most satisfactory key species or indicator for the general degree of browsing sustained in old growth.

Forest recreation: A bibliography (*U. S. Dept. Agr., Forest Serv., 1938, pp. VI+129*).—Herein are presented in mimeographed form a total of 929 selected references covering largely material published from 1917 to 1937.

DISEASES OF PLANTS

Introduction to plant pathology, F. D. Heald (*New York and London: McGraw-Hill Book Co., 1937, pp. XI+579, figs. 200*).—This textbook "has been written as the result of a demand from teaching plant pathologists for a somewhat briefer treatment of the subject than is presented in the author's Manual of Plant Diseases [E. S. R., 69, p. 663]. This new work is not an abridgment of the more complete manual but involves much added material and an entirely different order of presentation. . . . An attempt has been made to give the student a general view of the relation of plant diseases to human affairs. Following the introductory chapters the field of plant pathology as a whole is presented in the following sequence: Parasitic diseases, including those caused by fungi, bacteria, seed plants, and nematodes; virus diseases; nonparasitic diseases; plant-disease prevention or control; and methods of studying plant diseases." Literature references occur at the ends of chapters, and a subject index is provided.

A textbook of plant virus diseases, K. M. Smith (*Philadelphia: P. Blakiston's Son & Co., 1937, pp. X+615, pl. 1, figs. 101*).—Though in this textbook the viruses are classified, they are grouped according to the first-described or most important host plant (by Latin name) and placed in this order, following Hutchinson's classification system. The viruses chiefly associated with a particular host plant are numbered 1, 2, 3, etc. The book follows a common plan: The virus is first dealt with; its properties, modes of transmission, etc., are given; and then the diseases induced, arranged by plant families, are described. The insect vectors and suspected virus diseases requiring further study are included in separate, concluding sections. An appendix lists the host plants with the common virus disease symptoms known for each, together with the viruses causing them. Bibliographies appear at the ends of chapters, and general, virus, and author indexes are provided.

The ultracentrifugal isolation of latent mosaic virus protein, H. S. Loring and R. W. G. Wyckoff (*Jour. Biol. Chem., 121 (1937), No. 1, pp. 225–230, pl. 1*).—"The application of the quantity and analytical ultracentrifuges to the purification and characterization of the virus protein which is associated with the latent mosaic disease of potato in *Nicotiana glutinosa* and *N. tabacum* plants is described. The results of chemical analyses of the supernatant liquids following ultracentrifugation and ultracentrifugal analyses of purified preparations show that a homogeneous high molecular weight protein is obtained after three ultracentrifugations. Preparations made by the method outlined show a principal boundary with $s_{20}°=113\times10^{-13}$ cm. sec.$^{-1}$ dynes^{-1} and usually a second faint boundary with $s_{20}°=131\times10^{-13}$. The protein is present to the extent of about 0.02 to 0.1 mg per cubic centimeter of the juice of infected plants and was found to reach a somewhat greater concentration in diseased *N.*

glutinosa than in *N. tabacum* plants. The latent mosaic virus protein was found to be between 1,000 and 10,000 times more infectious than the original juice."

Bureau of plant pathology, D. G. MILBRATH (*Calif. Dept. Agr. Bul., 25 (1936), No. 4, pp. 575–582, figs. 2*).—Progress reports are given on work with peach mosaic, including a mosaic survey of peach and nectarine trees; celery mosaic; elimination of sclerotia of *Sclerotium rolfsii* from beet sugar factory waste waters; chestnut blight; nematodes (*Heterodera schachtii*) on sugar beets; dead arm disease (*Cryptosporella viticola*) of grapes; laboratory diagnoses, including 12 diseases due to nonparasitic causes, 16 due to bacteria, and 70 fungus genera associated with plant diseases; and diseases due to nematodes.

[**Progress of research with plant diseases in New York State**] (*N. Y. State Conserv. Dept. Ann. Rpt., 26 (1936), pp. 103–116, 117, 127–130, 132, 133*).—Progress reports are given on white pine blister rust control in State reforestation areas, the forest preserve, State nurseries, State parks, public campsites, recreation areas, and miscellaneous State lands, county reforestation areas, community and industrial forest lands, private lands, and in Resettlement Administration lands (with various tabulations). The work of the C. C. C. camps and Works Progress Administration on blister rust control and black currant elimination are also included.

The disease studies reported include the resinosis disease, due to an unidentified fungus often associated with *Polyporus schweinitzii* and now shown to be correlated directly with the physical structure and chemical reaction of the soil; the use of hardwoods on resinosis areas; red pine bark canker due to *Tympanis pinastri*, with recommendations for its control; inspections for white pine blister rust; and weather injury to trees.

[**Plant disease work by the Oregon Station**] (*Oregon Sta. Bul. 350 (1937), pp. 17, 39, 40, 46–51, 56, 60, 61, 66, 67, 68, figs. 5*).—Of the activities reported the following are of interest to phytopathology: Dioxan in virus disease diagnosis, walnut and filbert blight bacteria, relation of inoculation with symbiotic bacteria to yields and diseases of garden peas, *Verticillium* wilt of black raspberries, leaf and cane spot of bramble fruits, strawberry crinkle, virus tip blight of tomato, pea diseases, poinsettia yellows, pansy curly top, curly top diseases of vegetables, walnut and filbert blights, prune russet, *Cercosporella* foot rot of cereals, wheat bunt, downy mildew of hops, curly top resistant strains of vegetables, winter injury to orchards, woolly aphis and perennial canker on apple trees, blight-resistant pear stocks, Bosc necrosis and fruit pit of pears, little leaf of pears, pear scab control, gummosis-resistant cherry stocks, tomato tip blight, and pear scald control.

[**Plant diseases in Tennessee**] (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 57 (1937), pp. 167–170, fig. 1*).—The authors summarize the losses from plant diseases with particular reference to Tennessee, tabulating the data for 15 crop plants for the State and the United States as a whole, and presenting a graph of losses from 6 specific diseases in the State. Data are also presented on diseases of forests and on the cost of plant disease control work.

The cultural characteristics of the species of Fomes, W. A. CAMPBELL (*Bul. Torrey Bot. Club, 65 (1938), No. 1, pp. 31–69, figs. 128*).—Thirty-one species of *Fomes* were studied in detail as to their cultural characteristics, which were found to make their identification fairly certain. Individual isolates of a given species retained their peculiarities for indefinite periods, and there was no difference between cultures of the same individual prepared from rot or sporo-

phore. Macroscopic features of value in identification were color of mat, rate of growth, texture of mat and production of colored zones, and, at times, odor. Microscopic characteristics, in the order of importance, were the presence or absence of clamp connections, production of secondary spores, supplementary structures, and hyphal sizes. In culture, most species exhibited a decided response to light. The cardinal temperatures for growth differed among the species. Malt and potato-dextrose agars were the most suitable media tried. Varying the agar media proved to be of little value for identification of species, but tannic and gallic acids (5 percent in malt agar) gave a fairly good differentiation between the white rot and brown rot fungi. The cultural studies were valuable not only in diagnosing the cause of decay but also in differentiating between species closely related in external form as well as in distinguishing abnormal or aborted forms of the fungi.

New species of Sphaceloma on Aralia and Mentha, A. E. JENKINS (*Jour. Wash. Acad. Sci., 27 (1937), No. 10, pp. 412–414, figs. 16*).—*S. araliae*, causing a scab disease of *A. spinosa*, and *S. menthae*, causing the "leopard spot" disease of cultivated *M. piperata*, both in the United States, are described and illustrated.

Nature of variation in Helminthosporium sativum, J. J. CHRISTENSEN and F. R. DAVIES (*Mycologia, 29 (1937), No. 1, pp. 85–99, figs. 3*).—The results of this study by the Minnesota Experiment Station indicate that genetic variation in *H. sativum* is due primarily to nuclear change rather than to heterocaryosis.

Toxicity of mustard oils and related sulfur compounds to certain fungi, J. C. WALKER, S. MORELL, and H. H. FOSTER (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 536–541, figs. 2*).—As shown in this contribution by the University of Wisconsin and the U. S. D. A. Bureau of Plant Industry, sulfur oils differed widely in toxicity to a given organism, the type of radical attached to the structural nucleus of the molecule affecting the toxicity. In general, the descending order of toxicity was allyl, phenyl, methyl, and ethyl. Isomeric compounds sometimes varied widely. There was a wide range of sensitivity to allyl mustard oil among the five micro-organisms tested, the decreasing relative order being *Gibberella saubinetii, Colletotrichum circinans* and *Botrytis alii, Aspergillus alliaceus*, and *A. niger*. This oil was extremely toxic in the free state, while in the combined state (as the glucoside, sinigrin), the form in which it usually occurs in the plant, it showed no toxicity. The bearing of these results on the general problem of disease resistance is discussed.

Active halogen compounds of the war gas type as fungicides and bactericides. The lacrimator monoidoacetone, F. R. WEEDON (*Jour. Bact., 34 (1937), No. 6, p. 658*).—This is an abstract of a paper reporting promising results from tests on *Penicillium* spores, *Staphylococcus aureus*, and *Microsporon felinum*.

Zeolitic copper compounds as fungicides, A. A. NIKITIN (*Diss., Columbia Univ., New York, 1937, pp. 72, figs. 16*).—As a result of this study, copper zeolite, a new fungicide, has been formulated and prepared and its commercial production developed. Its physical and toxic properties are described. Extensive field tests are said to have demonstrated its value as a fungicide for use alone or in conjunction with insecticides. "These tests have substantiated all the early favorable predictions made for it since its first inception in the laboratory."

Notes on spray injury studies in Virginia, W. S. HOUGH (*Md. State Hort. Soc. Proc., 39 (1937), pp. 23–25*).—From the results of this study by the Virginia Experiment Station, begun in 1925, brief data are given on spray injuries by sulfur and copper fungicides and arsenicals, with notes on correctives.

Damping-off control: An evaluation of seed and soil treatments, K. J. Kadow and H. W. Anderson (*Illinois Sta. Bul. 439 (1937), pp. 289–348, figs. 9*).—In the surveys here reported damping-off was an important problem throughout the State wherever environal conditions favored the disease. It was estimated that 80 percent of the cases were due to *Pythium* spp. and 15 percent to *Rhizoctonia* spp., while *Botrytis* or *Fusarium* species were responsible in a few instances. The preemergence phase caused much more injury than the postemergence phase. Soil moisture and temperature proved to be the most important variables in influencing the preemergence phase, while high humidity and temperature were the chief factors in the occurrence of the postemergence phase of damping-off. Soil type and acidity did not, in general, seem important in the occurrence of either phase. It appeared from extensive observations that the interrelation of soil organisms has much to do with the incidence of damping-off, in some cases accentuating, and in others seeming to check, the parasitism of the causal fungi.

Of the variables studied, only moisture and soil acidity appeared directly to affect control by cuprous oxide, Semesan, or Vasco 4. At acidities greater than pH 5 cuprous oxide may cause considerable injury, but soil acidity appeared to have no effect on control by the other two preparations. Heavy rains soon after planting greatly reduced the value of Semesan for seed treatment, but did not materially influence the other two. There was some indication that with Semesan or cuprous oxide at greater than recommended concentrations injury may follow their use in typical pit sand.

In evaluating seed treatments, not only the control should be considered but also the sticking qualities, possible injuries, and effects on the general appearance and condition of some crop plants. The color of the compound was not always a reliable index of fungicidal efficiency, the actual copper present and the sticking qualities proving more accurate criteria.

In limited tests on spinach, cuprous oxide, organic mercury, and zinc oxide were all more effective (and in the order named) in controlling damping-off due to *Rhizoctonia* than that due to *Pythium*. However, no seed treatment thus far tested will give outstanding control on a susceptible crop under conditions especially favorable to infection. Under such conditions soil treatment should be resorted to, and extra precautions must be taken to prevent recontamination. No known seed treatment will adequately control postemergence damping-off if the seedlings are poorly aerated and the humidity is high. Under such conditions special postemergence treatments are necessary, and of those tried, applications of weak bordeaux to the seedlings at soil level gave nearly perfect control. Detailed recommendations for special conditions and crops are given relative to seed, soil, and postemergence treatments.

Damping-off control in Illinois, K. J. Kadow and H. W. Anderson (*Illinois Sta. Circ. 481 (1937), pp. 12, figs. 4*).—A fuller account is given in Bulletin 439 (see above).

Overwintering of certain cereal pathogens in Alberta, W. R. Foster and A. W. Henry (*Canad. Jour. Res., 15 (1937), No. 12, Sect. C, pp. 547–559, fig. 1*).—*Helminthosporium sativum*, *Fusarium culmorum*, *Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, *Wojnowicia graminis*, *Erysiphe graminis*, *Tilletia caries*, and *T. foetens* overwinter readily in the field at Edmonton, the first five being highly resistant to cold in both spore and vegetative stages. Even in a nonhardened condition several of these fungi survived severe frost. Detailed temperature relations are given. For example, mycelia of all foot rot fungi grown on sterilized barley seeds were viable in one test after 3 mo. of continuous freezing, and in another test after 40 alternate freezings and

thawings. *H. sativum* and *F. culmorum* growing in the soil survived 61 alternate freezings and thawings, and these two fungi and *L. herpotrichoides* retained their viability more readily on the soil surface than when buried 2-12 ft. below. *H. sativum* strains from high latitudes were no better adapted to low temperatures than those from lower latitudes. The bunt fungi proved capable of overwintering at Edmonton as mycelia in winter wheat, but in these experiments soil-borne spores did not survive. *E. graminis* overwinters in this latitude in the perithecial stage, and ascospores were found to be differentiated (under favorable conditions) before the first spring infections of winter wheat had been observed.

Fusarium spp. as root parasites of alfalfa and sweet clover in Alberta, M. W. Cormack (*Canad. Jour. Res., 15 (1937), No. 11, Sect. C, pp. 493-510, pl. 1, figs. 2*).—Five pathogenic species predominated among the numerous isolates obtained. Of these the closely related *F. avenaceum* and *F. arthrosporioides* appeared most important because they occur commonly and can cause serious root injuries both in spring and during the growing season. *F. culmorum* is very virulent during summer, but is apparently nonpathogenic in early spring. At both seasons *F. poae* and *F. scirpi acuminatum* are usually weak pathogens. Except for *F. avenaceum* on alfalfa and sweetclover and *F. scirpi acuminatum* on alfalfa, the species noted have not been previously reported on these hosts. The cardinal temperatures and carbon dioxide relations are described for these species. *F. avenaceum* produced more infection at temperatures up to 24° C. than at 27°. At 27° infection was much lighter in dry than in moist soils. *F. culmorum* caused severe injury at 18°-27°, but did not attack the roots at low temperatures. *F. avenaceum* usually attacked sweetclover roots more severely than those of alfalfa. All varieties of both hosts proved susceptible. *F. avenaceum* readily entered the roots through the basal tissues of branch roots or through lenticels. Variant forms of this species (frequent in pure culture) proved decidedly less pathogenic than the original isolates. The roots of both sweetclover and alfalfa were attacked by an isolate of *F. avenaceum* obtained from diseased roots of *Vicia americana*. *F. avenaceum*, *F. arthrosporioides*, and *F. culmorum* from alfalfa and sweetclover proved pathogenic for roots of *Trifolium* spp. and for seedlings of wheat, oats, and barley. Certain isolates from the cereals proved pathogenic to roots of alfalfa and sweetclover, and thus certain limits in crop rotation for reducing root rot injury due to these pathogens are indicated.

Study starvation signs on tobacco and cotton, C. B. Williams (*Better Crops With Plant Food, 21 (1937), No. 10, pp. 14, 15, 40, 41, figs. 2*).—This note from the North Carolina State College refers to potash and magnesium deficiency in tobacco and to "sand-drown" (magnesium deficiency) and "rust" (potash deficiency) in cotton, and to their control by small amounts of these elements added to the fertilizer. The foliage effects on both plants are illustrated.

The control of diseases and insects affecting vegetable crops on Long Island, C. R. Crosby and C. Chupp (*N. Y. State Col. Agr., Cornell Ext. Bul. 278, rev. (1937), pp. 98, figs. 8*).—This is a handbook of general information.

The inheritance of resistance to mildew, F. N. Briggs (*Amer. Nat., 72 (1938), No. 738, pp. 34-41, fig. 1*).—In this study of resistance inheritance to *Erysiphe graminis hordei* by the University of California, hybrids involving the three resistant varieties Arlington Awnless, Chinerme, and Nigrate were used. These were shown to differ from the susceptible Atlas in two independent major factors for resistance. Susceptibility to mildew was recessive. Crosses of these resistant varieties with Hanna and with Goldfoil segregated out susceptible

lines, indicating that the Hanna and Goldfoil factors were not carried by the resistant parents. Crosses of Chinerme and Nigrate with Arlington Awnless and of Nigrate with Chinerme produced no susceptible plants, proving that these varieties have at least one factor for mildew resistance in common.

Experiments with mold inoculation in cotton root rot areas, C. Thom and M. B. Morrow (*Soil Sci. Soc. Amer. Proc., 1 (1936), p. 223*).—This preliminary report on biological control of *Phymatotrichum* by *Trichoderma* proved sufficiently promising to justify further investigation.

Studies on the infection of cotton seedlings by Phymatotrichum omnivorum, L. Henderson (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 547–552, figs. 3*).—A modification of the Butler method (E. S. R., 73, p. 635) is described for inoculating cotton with *P. omnivorum* under sterile conditions in sand or liquid cultures. Infection of the seedlings occurs at the surface only in the presence of oxygen at about atmospheric concentration. The fungus staling products are thermostable and reduce the growth of both the fungus and the cotton roots. Cultures freshly isolated from living tissues in field or test-tube cultures gave higher rates of growth and infection than after culture on synthetic media for several months. The vigor of cultures which has been reduced by long saprophytic growth may be reestablished by passage through the living cotton plant.

Phymatotrichum (cotton or Texas) root rot in Arizona, R. B. Streets (*Arizona Sta. Tech. Bul. 71 (1937), pp. 293–410, figs. 40*).—This monograph on the *Phymatotrichum omnivorum* root rot, following a review of previous work (with 157 literature references), reports the results of a long series of studies begun in 1925 and involving many selected phases of the problem (geographical distribution, origin, losses caused, host range, symptoms, the fungus in its manifold relations, and control).

Root rot is widely distributed and indigenous in the semiarid southwestern United States and in the coastal plains of Mexico, but has not been reported from other countries. The greatest injuries are encountered in cotton, alfalfa, deciduous fruit and shade trees, and ornamentals, the total annual losses having been estimated as $100,000,000 in Texas and $50,000,000 more elsewhere, including $500,000 in Arizona. This soil-inhabiting fungus attacks over 1,700 plant species, including not only most of the cultivated dicotyledonous plants but also many weeds and native plants. It is not often destructive to the native vegetation. The symptoms induced and the causal organism with its life history (vegetative spore mats and other possible spore stages, pseudosclerotia, sclerotia, methods and rate of spread, and overwintering), growth cycles in root rot spots, pathogenicity, and pathogenesis are discussed and illustrated in great detail. While the fungus is more or less active throughout the year, root rot is conspicuous only during hot weather in Arizona, when the affected plants wilt and suddenly die. The fungus spreads from plant to plant along the roots or for short distances directly through the soil, penetrating susceptible host roots in many places. It is not spread by the spores or by water (except rarely by washing of sclerotia), and the behavior of root rot areas offers no evidence of general distribution by tillage implements or cultural practices. Overwintering occurs in the active vegetative state in living roots, on deeply buried dead roots, and in the dormant state as sclerotia or sclerotial strands.

Root rot is one of the most difficult of plant diseases to control on account of its wide host range and the difficulty of eradicating it from infested soil. Rotation with nonsusceptible crops (e. g., monocotyledonous plants), together with clean culture, is the most economical method where large areas are

involved. Heavy applications of ammonium compounds have proved practicable for small areas where valuable orchard or ornamental plants are concerned. Soil disinfectants and crop or mechanical barriers may also be used to limit the spread of root rot, and sulfur applications offer a promising control method though still in the experimental stage. Lime, potash, sodium chloride, or phenyl mercury acetate proved ineffective, and many cultural practices, though reducing the amount of root rot, rarely eradicated it. In addition to the general recommendations for control, detailed procedures are included for special crops and conditions. Examination of susceptible plant species, air mapping, and a search for spore mats and sclerotia are noted as of value in the selection of root rot-free areas. While the data, except for cotton, are too meager to permit definite conclusions, there appears to be no marked difference in the susceptibility of different varieties within a species, except for grape, plum, and citrus. The development of resistant cotton strains still remains in the experimental stage.

The parasitism of Colletotrichum lagenarium (Pass.) Ell. and Halst., D. V. LAYTON (*Iowa Sta. Res. Bul. 223 (1937), 33–67, figs. 12*).—The typical symptoms of cucurbit anthracnose are given for the more common hosts, and are briefly described for each new host. A previously unrecorded symptom is reported for watermelon on the runners near the crowns. In inoculation tests no infection occurred with 15°–16° C. or less during the 14- to 16-hr. period in the moist chamber.

The susceptible host range was extended to include *Apodanthera undulata*, *Cucurbita foetidissima*, *C. texana*, *Ibervillia tenuisecta*, *Luffa* sp., and *Sicyos parviflorus*. *Cucurbita* proved to be the most resistant genus studied, while *Cucumis* and *Citrullus* were most susceptible. Using a technic for inoculating and measuring the relative resistance to *Colletotrichum lagenarium*, developed for this study and here described, slight differences in resistance and susceptibility were found in commercial watermelon, cantaloup, and cucumber varieties, but in no case was the resistance sufficient to be of commercial importance. The comparative resistance or susceptibility is given for the following numbers of varieties and/or selections of watermelon (836), cantaloup (139), cucumber (18), and *Cucurbita* spp. (21).

Three edible, noncommercial African watermelon varieties proved highly resistant to anthracnose but susceptible to wilt. Crosses of these varieties were made on Iowa Belle, Iowa King, and a few miscellaneous watermelon varieties, with the result that anthracnose resistance proved dominant to susceptibility, and segregation in the F_2 and in the F_1 backcross indicated the involvement of only a single factor pair for resistance and susceptibility. From these crosses watermelon strains have been developed that are resistant to both anthracnose and wilt.

Comparative reaction of oat varieties in the seedling and maturing stages to physiologic races of Puccinia graminis avenae, and the distribution of these races in the United States, M. N. LEVINE and D. C. SMITH (*Jour. Agr. Res. [U. S.], 55 (1937), No. 10, pp. 713–729, pls. 8*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Minnesota Experiment Station, inoculations of the 10 known physiologic races of oat stem rust were made under comparable and reasonably uniform greenhouse conditions on 27 varieties and strains of oats as seedlings, on 7 of them as adult plants using all 10 races, and on 6 varieties as adult plants using race 6 only. Special care was used to insure the purity of the races tested.

The reactions in the seedling stage group made it possible to place them in four categories, in three of which were included those varieties possessing reac-

tion characteristics typical of differential hosts. The fourth group consisted of varieties showing no discernible difference in reactions with respect to one another or to the different physiological races of stem rust. Regardless of fungus race, there was a remarkably close agreement of seedling with maturing plants of all varieties and strains compared. It thus seems apparent that seedling reaction is a reliable index of the reaction of adult oat plants to specific physiologic races of this rust, but further investigation is advised before too general conclusions are drawn.

While during 1921–35 physiologic races 1, 2, 5, 7, and 10 have at one time or another been isolated from affected oat material collected in various parts of the United States, only races 2 and 5 have been important in the stem rust epidemics during this period. It is thought that the present restricted physiologic specialization of *P. graminis avenae* in this country removes a serious impediment from attempts at breeding desirable rust-resistant oat varieties. Adequate resistance to the dominant races 1, 2, and 5 is available in the oat varieties listed in group 2, and these varieties are also highly resistant to race 7. The group-1 varieties are at least moderately resistant to the common races, as well as to race 10. To insure against the introduction or invasion of the more virulent rust races, it is deemed advisable to develop oat varieties with desirable agronomic characters that would resist their attack. The seedling-inoculation method should expedite the attainment of this end.

The bibliography includes 42 references.

The effects of coal tar and other chemicals on the roots of Allium cepa, M. Levine and H. Bergmann (*Amer. Jour. Cancer, 26 (1936), No. 2, pp. 291–315, figs. 28*).—The results of macroscopic and microscopic studies of the effects of carcinogenic agents (coal tar preparations, dibenzanthracene, Scharlach R. ether, and petrolatum) on the growth and development of onion roots in relation to tumor formation suggested that the reactions of the plant are not specific results of the chemicals used but are due rather to the nature of the organism itself.

The Mycosphaerella disease of winter peas and diseases of winter peas and vetches caused by Ascochyta species, J. L. Seal (*Alabama Sta. Rpt. 1936, pp. 24, 25*).—Diseases due to *A. pinodella*, *A. pisi*, and *M. pinodes*, the first being the predominant organism concerned, are briefly noted.

Control of diseases and insect pests of potatoes in up-State New York, M. F. Barrus and C. R. Crosby (*N. Y. State Col. Agr., Cornell Ext. Bul. 238, rev. (1937), pp. 27, figs. 5*).—This is a handbook of general information.

Comparative studies in potato virus diseases, D. F. Putnam (*Canad. Jour. Res., 15 (1937), No. 3, Sect. C, pp. 87–107, pls. 3*).—"This paper is an account of an investigation into the identity of a hitherto undescribed mosaic disease of President potato. Both a mild and a severe form of the disease were observed, but both forms were characterized by a yellow mottling not found in the previously reported potato mosaics. The mild form of the disease has been shown to be caused by a single virus, while the severe form is due to a combination of this virus and one of the 'vein-banding' group. Because of the yellow color associated with the symptoms produced on a number of host plants, the name 'yellow mottle' is proposed for the newly described virus. The yellow mottle virus of President mosaic has been compared with the 'mottle' and 'ring spot' viruses from rugose mosaic, both as to behavior under certain physical and chemical tests and with respect to the symptomatological reaction of a number of solanaceous host plants. Tabulated results of the differential property studies are given, and descriptions of the symptoms caused by each of the three viruses on eight different host plants are presented.

"From these studies it is concluded that the newly described yellow mottle virus is distinct from both mottle and ring spot, but it is closely related to the 'X-virus' or 'latent virus' group."

Some properties of potato rugose mosaic and its components, D. Folsom and R. Bonde (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 10, pp. 765–783, figs. 6*).—This study from the Maine Experiment Station indicates rugose mosaic to be composite, including pure rugose mosaic (vein-banding mosaic), and latent potato mosaic. When a partly grown potato or tobacco plant becomes infected by rugose mosaic, the leaves are often affected differently according to age, some becoming necrotic, the older ones showing no signs, and the younger ones becoming mottled. Rugose mosaic aggravated a toxic effect of potato extract on tobacco which was eliminated by Berkfeld-candle filtration. Rugose and latent mosaics were studied better on potato, tobacco, and jimsonweed than on tomato and several other solanaceous plants. Beans proved immune. The best method found for inoculating potato plants was by leaf mutilation, while for tobacco and jimsonweed application by means of a wooden pot label proved most satisfactory. Extracts from rugose-mosaicked green shoots proved more infective than those from affected colorless sprouts, seed tubers, or roots, and were sometimes reduced in infectiveness by clarification. In affected potato, the age of the plants or their parts had more effect in determining the infectiveness of their extracts than in tobacco. The infectiveness of leaves was soon lost on drying. Aging in vitro for several hours increased the infectiveness of extracts, but further aging progressively reduced it, and under some conditions the virus became inactivated within a few days. Infectiveness was inhibited later at low temperatures, and later in tobacco than in potato. Latent mosaic virus sometimes resisted aging longer than that of pure rugose mosaic.

Extracts of rugose mosaic were usually inactivated when brought to 60°–65° C., or when held for 10 min. at 55°, but the thermal death point varied. Extracts of this virus were inactivated at about 1–0.1 percent on dilution in water, and healthy potato juice had a slightly greater inactivating effect. Latent mosaic virus was somewhat more persistent than the rugose. Pokeweed juice inactivated rugose mosaic but not latent mosaic extracts. The virulence of rugose mosaic virus was considerably reduced by ultrafiltration, whereas the latent mosaic virus was but little affected. Neither 80 pounds' pressure nor clarification reduced the infectiveness of rugose mosaic extract significantly. Latent mosaic virus was more resistant to formaldehyde and an H_2SO_4 cleaning fluid than the rugose, but was similar in response to other chemicals tested. The lethal point of HCl for rugose mosaic varied with conditions within the range of about 0.07 to over 0.5 percent. The inactivating strength for ethyl alcohol was over 50 percent, for NaCl about 5 percent, for HCHO about 0.5 percent, for HCl and NaOH about 0.2 percent, and for $CuSO_4$ and the cleaning fluid about 0.1 percent.

Preliminary comparisons of mosaics on potato and other plants indicated that the methods used for these studies of the properties of rugose mosaic are unsatisfactory for mild, crinkle, and leaf-rolling mosaics of potato. It was found that tobacco mosaic can infect Green Mountain potatoes, and that potato streak and tobacco spot necrosis both resemble mosaic. The virulence of latent mosaic was not increased by eight successive tobacco passages.

The bibliography contains 23 references.

A study of potato yellow dwarf in New York, L. M. Black ([*New York*] *Cornell Sta. Mem. 209* (*1937*), *pp. 23, pls. 4, figs. 2*).—Yellow dwarf has caused serious losses to the certified seed potato industry of New York, and the loss to table-stock growers has also sometimes been heavy. The acute and chronic

stages are differentiated, and previous descriptions of the acute stage are supplemented by a description of the floral symptoms. Amelioration of the symptoms in the chronic stage was found to progress to a certain apparent equilibrium between the unattenuated virus and the changed host.

Myzus persicae failed to transmit the virus, and evidence was also negative for *Empoasca fabae*, *Macrosiphum solanifolii*, *Myzus pseudosolani*, *Deltocephalus inimicus*, *Phenacoccus gossypii*, *Pseudococcus citri*, *Lygus pratensis*, and the potato flea beetle. However, the clover leafhopper *Aceratagallia sanguinolenta* proved to be a vector. Its range (throughout the United States, except the Pacific slope) includes the known range of yellow dwarf. It may occur in potato fields from the time when the sprouts emerge until the vines die and may be found viruliferous in any season, being capable of overwintering the virus. Viruliferous leafhoppers may occur generally distributed in clover fields.

Among the legumes, *Trifolium pratense*, *T. hybridum*, *T. repens*, and *T. agrarium* proved susceptible, and medium red clover *T. pratense* is probably an important reservoir. In the Solanaceae, the virus was transferred to 17 U. S. Department of Agriculture seedling varieties and 6 wild species of potato. *Lycopersicon esculentum*, *Physalis heterophylla*, and *Hyoscyamus niger* also proved susceptible.

Control measures are discussed in the light of the experimental results. It is recommended that seed plats be isolated from both diseased clover and diseased potatoes. Roguing proved unavailing where the disease was spreading rapidly. No control may be expected from selecting either small or large seed potatoes. Precautions against spread by the cutting knife proved unnecessary. Development of new infections at the edge of a field in August may be taken as a warning that it has been invaded in the current season. Before use for seed, potatoes from such fields should be tested by growing or slicing a sample to ascertain more accurately the extent of the invasion.

Potato yellow dwarf and medium red clover, E. O. Mader (*Amer. Potato Jour., 14 (1937), No. 9, pp. 293–295*).—The general results are reported of investigations by the [New York] Cornell Experiment Station on this disease, carried by the clover leafhopper (*Aceratagallia sanguinolenta*). Not only is *Trifolium pratense* a host (E. S. R., 75, p. 494), but evidence is presented indicating that it may be seed borne and thus account for sporadic outbreaks in new centers. Elimination of susceptible clover in the vicinity of potato fields is suggested as a practical means of preventing invasion by the disease.

Insects that carry mosaic disease of sugarcane, J. W. Ingram (*Sugar Bul., 16 (1937), No. 6, pp. 4–7*).—In addition to *Aphis maidis*, the author, in cooperation with E. M. Summers, reports trials in Louisiana in which the rusty plum aphid (*Hysteroneura setariae*) and the green bug or spring grain aphid (*Toxoptera graminum*) also transmitted this virus. Other suspected sucking insects are named, and the influence of various environal conditions on the vectors and on the disease are discussed.

The soil rot disease of sweet potatoes, L. H. Person and C. W. Edgerton (*Louisiana Sta. Circ. 21 (1937), pp. 7, figs. 5*).—The fungus-induced soil rot or "pox" disease is said to be threatening the sweetpotato industry in certain sections of the State, where it has been known since 1922 but not fully appreciated as serious until 1934. Preliminary tests gave promising results from soil applications of sulfur at the rate of 700 and 1,000 lb. to the acre, but the method must be tried in other seasons and under different conditions before it can be used generally. It is recommended that all possible measures be used to keep the infection from new fields or localities and that outside seed be used only when known to be from localities free from the disease.

Blue mold infests tobacco fields, R. R. KINCAID (*Fla. Grower, 45 (1937), No. 11, pp. 16, 17, fig. 1*).—This contribution by the North Florida Experiment Station gives a brief summary of data on this disease and its control, with seasonal records for the State (1937).

Control of tobacco blue mold (downy mildew) and tobacco flea beetle (a progress report in two parts).—I, Control of tobacco blue mold (downy mildew), S. A. WINGARD and R. G. HENDERSON (*Virginia Sta. Bul. 313 (1937), pp. 1–10, figs. 4*).—The symptoms and fungus causes of blue mold are briefly discussed and recommended measures for control are outlined in detail, including the cultural, spray, and fumigation procedures. Part 2 is noted on page 830.

Studies on tobacco downy mildew in Virginia, R. G. HENDERSON (*Virginia Sta. Tech. Bul. 62 (1937), pp. 20, figs. 8*).—Histological studies of seedling leaves infected with *Peronospora tabacina* indicated that the parasite may penetrate the epidermis directly. After infection the fungus develops abundant intercellular hyphae in the leaf mesophyll and stem cortex, and parasitizes the host cells by haustoria. Nutrition tests indicated that tobacco with a high nitrogen or low potassium supply is more resistant than with the reverse proportions.

A preparation of cuprous oxide and cottonseed oil proved most effective of the sprays tested. Calcium monosulfide was also effective, but caused severe injury when treated plants were transferred to the field in dry, warm weather.

Twenty-one literature references are included.

Chemical studies on the virus of tobacco mosaic, VIII–X, W. M. STANLEY (*Jour. Biol. Chem., 117 (1937), No. 1, pp. 325–340, fig. 1; 2, pp. 755–770; 121 (1937), No. 1, pp. 205–217*).—Continuing this series (E. S. R., 77, p. 800), the following three papers are included:

VIII. *The isolation of a crystalline protein possessing the properties of aucuba mosaic virus.*—"A crystalline protein which has the properties of aucuba-mosaic virus has been isolated from Turkish tobacco plants infected with this virus. The virus activity, chemical composition, optical rotation, crystalline appearance, X-ray diffraction pattern of crystals, and general chemical and serological properties of this protein are either identical or very similar to those of tobacco-mosaic virus protein. Aucuba-mosaic virus protein may be distinguished from the latter by its larger crystals, its more silky and opalescent solutions, its lower solubility, its more alkaline isoelectric point, and its greater sedimentation constant. The isolation, from Turkish tobacco plants diseased with aucuba-mosaic virus, of a crystalline protein differing from tobacco-mosaic virus protein demonstrates that two different strains of a virus give rise to two different proteins."

IX. *Correlation of virus activity and protein on centrifugation of protein from solution under various conditions.*—"Ultracentrifugation of solutions of mixtures of tobacco-mosaic virus protein and tobacco proteins, egg albumin, trypsin, and pepsin, respectively, resulted in the sedimentation of the high molecular weight virus protein in the form of a crystalline mass at the bottom of the tube and in the concentration of the virus activity in this protein mass. The supernatant liquids containing the low molecular weight proteins were found to possess practically no virus activity. This indicates that the virus activity is not due to an agent which may be separated from the high molecular weight protein and transferred to other proteins, such as low molecular weight tobacco proteins, egg albumin, trypsin, or pepsin.

"When virus proteins were centrifuged at their isoelectric points or when negatively or positively charged virus protein ions were centrifuged from solution on an angle centrifuge so that the upper portion of the supernatant liquids

contained from about 5 to 15 percent of the original protein, the virus activity of different portions of the centrifuged preparations was proportional to the amount of high molecular weight protein present. Ultracentrifugation of over 99.9 percent of the high molecular weight virus protein from solution yielded a supernatant liquid possessing an activity approximately proportional to the protein remaining in solution. The results demonstrate that in solutions at different hydrogen-ion concentrations and in the presence of other proteins the virus activity remains with the high molecular weight protein, and are evidence, therefore, that the virus and the protein are identical and hence that the virus activity is a specific property of the high molecular weight protein."

X. *The activity and yield of virus protein from plants diseased for different periods of time.*—"The increase of tobacco-mosaic virus protein in Turkish tobacco plants has been determined by isolating the virus protein in plants diseased for different periods of time. The efficiency of the isolation technic was determined by isolating virus protein from artificially prepared mixtures containing known amounts of virus protein. It was found that about 40 percent of the virus protein can be isolated from plants containing only about 1 part of virus protein per 100,000 parts of plant material. Virus protein in Turkish tobacco plants was found to increase from an estimated 10^{-6} mg per gram of plant material to about 3 mg per gram of plant material during the course of 5 weeks. Virus protein in inoculated leaves was estimated to increase over a million times during a 4-day period. Although the virus protein content was found to reach a maximum 5 weeks after inoculation, the rate of increase was found to be greatest during the first 3 weeks. The total nitrogen content of extracts of diseased plants was found to remain about constant over long periods of time, whereas the protein nitrogen content was found to increase and reach a maximum and then to decrease. The amount of low molecular weight protein was found to decrease as the amount of the virus protein increased. No significant difference was found in the virus activity of protein obtained from plants that had been infected for from 2 to 13 weeks, although that of protein obtained from plants infected for only 1 week was significantly less."

Molecular sedimentation constants of tobacco mosaic virus proteins extracted from plants at intervals after inoculation, R. W. G. Wyckoff (*Jour. Biol. Chem., 121 (1937), No. 1, pp. 219–224, pl. 1*).—"Analytical ultracentrifugal studies have been made of the sedimentation rates of virus proteins isolated from series of Turkish tobacco plants harvested 1, 2, etc., up to 13 weeks after inoculation with the ordinary strain of tobacco-mosaic virus. These protein samples were prepared in two ways, half by quantity ultracentrifugation and half by chemical methods involving ammonium sulfate precipitations, the solvent in both cases being 0.1 M phosphate buffer of pH 7. The virus proteins extracted from plants within 4 weeks of inoculation and purified by quantity ultracentrifugation consist of a single molecular species. These molecules, which are also present in all other preparations, have $s_{20°} = 174 \times 10^{-13}$ cm sec.$^{-1}$ dynes^{-1}. A second molecular component with $s_{20°} = 200 \times 10^{-13}$ exists in the 2- and 3-week samples made with ammonium sulfate and develops after a few days in the corresponding ultracentrifuged proteins; it is present in the proteins from plants that have carried the disease for more than 4 weeks. The very young 1-week protein differs from those longer in the plant in that even treatment with ammonium sulfate does not produce the heavy molecular component.

"Tobacco-mosaic virus proteins isolated by ultracentrifugation from plants 2 and 13 weeks after inoculation are single boundaried if distilled water rather than phosphate buffer is used as solvent. The virus protein in the plants

themselves hence consists of only one molecular species; it changes with length of time after inoculation, becoming more and more readily influenced by salts.

"Tobacco-mosaic virus proteins isolated and purified by differential ultracentrifugation or by two cautious crystallizations with ammonium sulfate show a high degree of molecular homogeneity; when water rather than phosphate is used as solvent, the ultracentrifuged proteins are unusually homogeneous. The sharply sedimenting boundaries of such proteins contrast with the diffuse boundaries and greater mean sedimentation constants given by samples subjected to more extensive treatment with chemicals."

An ultracentrifugal study of the pH stability of tobacco mosaic virus protein, R. W. G. Wyckoff (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 239–247, pls. 2, fig. 1*).—On the alkaline side of the isoelectric point the virus protein molecules remained unchanged for at least 2 mo. at H-ion concentrations up to 8, decomposition occurred at pH 9, was more rapid as the pH was raised, and was practically instantaneous at pH 11. The split products were smaller in the more alkaline solutions. On the acid side, the molecular changes began at pH 1.8–1.5, and at pH 1.5 destruction was complete within a few hours.

The three protein samples tested were isolated by quantity ultracentrifugation and gave sharply sedimenting boundaries. One was double-boundaried, and the other two contained only one molecular component.

Insofar as different experimental conditions permitted comparisons, the effects of pH on infectivity and molecular stability were parallel, which agrees with the assumption that infectivity is a property of the protein molecules.

Influence of host nutrition on systemic development of tobacco mosaic, E. L. Spencer (*Plant Physiol., 12 (1937), No. 3, pp. 825–832*).—Symptoms of systemic infection with a yellow strain of tobacco mosaic appeared earlier in sand-culture plants that had received nutrient solutions containing either a deficiency or excess of nitrogen than in those with medium amounts, and it appeared immaterial whether treatment with excess nitrogen started 1 or 4 weeks before inoculation. Plants with no phosphorus showed systemic symptoms earlier than those that had received excess phosphorus for 1 week prior to inoculation, and the latter showed symptoms earlier than plants receiving excess phosphorus for 2, 3, or 4 weeks prior to inoculation. The plant growth was directly correlated with the duration of the excess-phosphorus treatment. The time of appearance of systemic symptoms was also directly correlated with the duration of excess-potassium treatment, but the high-potassium treatment retarded growth more than the potassium-deficient treatment.

It is concluded that systemic development was accelerated by high-nitrogen nutrition and retarded by either high-phosphorus or high-potassium nutrition. The rapidity with which the systemic symptoms developed showed no apparent correlation with the distance the virus had to travel.

The parasitism of Cladosporium fulvum Cooke and the genetics of resistance to it, A. N. Langford (*Canad. Jour. Res., 15 (1937), No. 3, Sect. C, pp. 108–128, pls. 3, fig. 1*).—Four physiologic forms of this imperfect fungus (causing the leaf mold disease of tomato) were differentiated by pathogenic differences, and cultural studies also indicated this species to be a composite of physiologic forms. Saltant strains of differing degrees of stability were isolated repeatedly from single one-celled spore cultures, and since each cell of a conidium contains a single nucleus these saltant strains are considered to have arisen as a result of mutations (in the broad sense of the term). Four classes of reaction to the fungus are defined, viz, complete susceptibility, two types of partial resistance, and immunity. The reaction between pure lines of the host and para-

site is said to be plastic. Environally conditioned variations in each of the four reaction types are described, and the seasonal fluctuations in the reaction of the Stirling Castle variety to Form 1 are noted as outstanding. The failure in the expression of the inherent resistance to this variety during midwinter at Toronto is shown to be due largely to the reduced light experience of plants grown at this time, while the failure of such plants to support sporulation is due to the low relative humidity in the greenhouses.

The Red Currant tomato (*Lycopersicum pimpinellifolium*) was found to carry, in addition to the dominant factor for immunity, an independently segregating dominant factor which, in the absence of the immunity factor, governs resistance to all four strains of *C. fulvum*. The resistance of Stirling Castle to Forms 1 and 3 is shown to be due to another dominant factor. Among the host genetic factors modifying the main reaction types is the recessive lutescence factor in the homozygous condition. Its most striking effect is the production on genetically immune individuals of small, inconspicuous infection spots whose increase in size is soon arrested. The linkage studies have located the three resistance factors in MacArthur's chromosome maps of the tomato.

The conflicting reports on the resistance of tomato varieties to *C. fulvum* are discussed in the light of physiologic specialization and of a plastic host reaction.

Increase of transpiration rates of tomato leaves due to copper sprays, K. K. Krausche and B. E. Gilbert (*Plant Physiol., 12 (1937), No. 3, pp. 853–860*).—As a result of this study by the Rhode Island Experiment Station, it is deemed probable that copper and calcium on a leaf surface will readily penetrate to induce changes in the permeability of the membranes of the guard and mesophyll cells so that water loss occurs at varying rates. It also seemed evident, in substantiation of earlier work, that copper sprays increase transpiration, particularly at night. In tomato leaves the major portion of this increased transpiration was not stomatal, and copper sprays did not seem to affect the behavior of the stomata. It is concluded that in tomatoes transpiration must occur largely through the cuticle, and that this must be subject to great modifications in rate by copper sprays.

Environmental conditions influencing the development of tomato pockets or puffs, A. C. Foster and E. C. Tatman (*Plant Physiol., 12 (1937), No. 3, pp. 875–880*).—Except for the literature review (with bibliography of 11 titles), the essential points of this work have been previously noted from another source (E. S. R., 78, p. 66).

The control of canning tomato diseases in Pennsylvania, R. S. Kirby and O. D. Burke (*Canner, 86 (1937), No. 2, pp. 20, 22*).—The data presented in this contribution from the Pennsylvania Experiment Station indicate that seedbed spraying should be adopted as a regular practice, and that under severe disease conditions field spraying with some of the newer types of copper sprays may be profitable. Of the numerous diseases attacking tomatoes in the State, *Alternaria* collar rot and leaf spot, *Septoria* blight, mosaic, *Fusarium* wilt, and bacterial canker are said to cause the greatest losses, in descending order of importance.

Breeding high-quality wilt-resistant watermelons, D. R. Porter (*California Sta. Bul. 614 (1937), pp. 43, figs. 16*).—Seven watermelon varieties (five developed in Iowa and one each in Florida and Australia) proving resistant to *Fusarium niveum* in California but not of acceptable type or quality under the conditions there indicated the need for local resistant strains. Continued propagation of resistant stock of the susceptible Klondike and Grey Monarch

varieties (carrying the genes for resistance), with complete control of self-pollination, has resulted in new varieties resistant enough for profitable crop production on badly infested soil. Hybrids of Klondike with Pride of Muscatine or Iowa King proved decidedly inferior to Iowa Belle-Klondike hybrids. Klondike R7, a new resistant variety released recently, differs from commercial Klondike in fruit type, skin sutures and color, and reaction to wilt, and it is recommended for any locality where Klondike has proved adapted.

A brief history is given of the development of wilt-resistant varieties, indicating that the genes for resistance are carried by the commercial varieties Kleckley Sweet, Dark Seeded Grey Monarch, White Seeded Grey Monarch, and Klondike. The resistance in Iowa Belle, Iowa King, Conqueror, and Klondike R7 is traced back to the stock citron used by W. A. Orton in developing resistance to *F. niveum*. Improved Stone Mountain No. 5 obtained its resistance from Japan No. 7.

The value of the refractometer in breeding work was indicated, and numerical values of shape indexes were found useful. The host-parasite relationships in wilt are discussed, and certain precautions for the benefit of seed producers are noted. The definite need is stressed for some more refined technic for determining accurately the relative resistance of varieties and hybrid material.

Black stem rust: Its history, biology, and control in connection with the barberry question, E. LEHMANN, H. KUMMER, and H. DANNENMANN (*Der Schwarzrost: Seine Geschichte, seine Biologie, und seine Bekämpfung in Verbindung mit der Berberitzenfrage. München (Munich): J. F. Lehmanns Verlag, 1937, pp. XXIV+584, pl. 1, figs. 87*).—This monograph of the subject concludes with an index and over 56 pages of literature references arranged alphabetically by authors.

A study of the fungous flora of wheat roots, P. M. SIMMONDS and R. J. LEDINGHAM (*Sci. Agr., 18 (1937), No. 2, pp. 49–59, pl. 1, fig. 1*).—The authors studied 806 isolates representing 27 genera from the subcrown internode and roots of wheat plants excavated in Saskatchewan (1935–36), the results being tabulated and totaled to show the vertical distribution and frequency of their occurrence at the two stations investigated. More isolates were obtained from the first foot than from lower levels, and over 50 percent of the total identified were classed as pathogenic. Pathogenic fungi were rarely isolated from roots below the first foot, and miscroscopic examination of preserved material rarely revealed lesions on roots below that level. A probably mycorhizal fungus was commonly seen in many of the seminal root collections. The pathologic significance of these studies is briefly discussed.

Fruit diseases in 1935, O. C. BOYD (*Mass. Fruit Growers' Assoc. Rpt., 42 (1936), pp. 34–37*).—This contribution by the Massachusetts State College presents local seasonal data on diseases of apples and small fruits.

The boron content of apple tissues as related to drought spot and corky core, C. G. WOODBRIDGE (*Sci. Agr., 18 (1937), No. 1, pp. 41–48*).—Low boron concentrations in the tree tissues were correlated with high incidence of these diseases. In twigs from trees severely affected the content was generally below 10 p. p. m., while in those from healthy trees it did not usually fall below 14 p. p. m. No correlation was found between low concentrations of boron in the soil and incidence of the disease, but high soil concentrations, induced by treatment with either boric acid or borax, were associated with a general freedom from these diseases.

The origin of russeting in the Golden Russet apple, H. P. BELL (*Canad. Jour. Res., 15 (1937), No. 12, Sect. C, pp. 560–566, figs. 15*).—"About the time of full bloom many epidermal cells divide by a tangential wall. Later in June

all the epidermal cells become vacuolated, and some divide again by tangential walls forming a layer varying from two to four cells thick. Early in July a cambium is initiated in the innermost cells of epidermal origin. This cambium is very active and immediately gives off cells which differentiate into cork. Nonrusseted portions may have either a very thick convoluted cuticle or a double layer of cuticle. The development of the periderm and the histology of the mature protective layers are illustrated."

Factors influencing the development of soggy break-down in apples, H. H. Plagge and T. J. Maney (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 10, pp. 739–763, figs. 7*).—As a result of 11 years' study by the Iowa Experiment Station, it is shown that fruit maturity at picking date affects its tendency to break-down, but not always in the same direction for different varieties. Prompt storage frequently caused Jonathan (and usually Northwestern Greening) to be more susceptible, while similar storage of Grimes Golden, Wealthy, and Golden Delicious usually caused them to be more resistant. Three seasons' tests with Winter Banana indicated a response similar to Jonathan. When held 5-10 weeks at 50° F. before storage, Jonathan, Grimes Golden, Winter Banana, and Northwestern Greening exhibited marked resistance to soggy break-down, while Golden Delicious developed more of the trouble, though tending also to resistance. Results with picking-maturity and prestorage-delay tests suggested that susceptibility is associated with the stage of respiratory activity attained by the fruit when stored. Continuous movement of the storage-room air proved unsatisfactory as a control measure.

Studies on the periodic development of the condition indicated the initial and final dates of its occurrence and a rather definite period of development. Jonathan with 100-percent color in storage at 30° proved more susceptible than fruit of like maturity having 25 to 50-percent color. Northwestern Greening with full color was also more susceptible. Of the varieties tested the last named was the only one in which large fruits were more susceptible than small fruits. Varieties from the same orchards in different years, and from different orchards in the same year, showed marked differences in susceptibility to break-down.

The general conclusion as to control is that the most satisfactory method in all susceptible varieties under all the conditions tested is to store apples at 36° rather than at lower temperatures.

A bibliography of 21 titles is included.

***The shot-hole disease of peaches, apricots, and almonds*, E. E. Wilson** (*Blue Anchor, 14* (*1937*), *No. 11, pp. 6, 7, figs. 3*).—Fuller results of this study by the California Experiment Station have been previously reported (E. S. R., 78, p. 67).

[The control of peach diseases in Virginia], R. H. Hurt (*Virginia Sta. Bul. 312* (*1937*), *pp. 16, fig. 1*).—This study is reported in two parts as follows:

I. *The control of peach leaf curl, scab, and brown rot*.—According to the field trials reported, leaf curl can be controlled under Virginia conditions with bordeaux mixture, lime-sulfur solution, or coal tar oil spray thoroughly applied before the buds swell. Brown rot is said to be easily controlled with sulfur sprays if the orchard has been thoroughly cleared of mummies during the dormant season, 3-4 applications usually sufficing for fruit rot control. The preharvest application is deemed the most important for insuring against fruit rot in Virginia. Peach scab is also easily controlled, the sulfur sprays used against brown rot sufficing for this disease as well.

II. *Spray materials for peaches*.—Some of the newer developments in peach fungicides are summarized, including home-made wettable sulfur (with discussions of wetting agents, reconditioning the sulfur, methods of wetting sulfur,

wettable sulfur with lime-sulfur and Glutrin, and a method of preparing wettable sulfur, using lime-sulfur and Glutrin as the wetting agent), commercial wettable sulfurs (Kolofog, Flotation sulfur, Mike sulfur, Micronized sulfur, Sulcoloid, and Crown sulfur), and the place of zinc sulfate in the peach spray program, including its effect on the peach tree, its value as a fungicide and as a preventive of arsenical injury, and methods of preparing zinc-lime spray and of adding wettable sulfurs and lead arsenate to the zinc-lime spray.

Home-made wettable sulphur as a peach fungicide, R. H. HURT (*Va. State Hort. Soc. Rpt., 41 (1936), pp. 201–203*).—This contribution by the Virginia Experiment Station gives a general discussion of the subject, including the proper grade of sulfur, the amount to use, wettable agents for sulfur, and methods of preparing home-made wettable sulfur.

Another role of zinc-lime in combination peach sprays, J. W. HEUBERGER and J. F. ADAMS (*Peninsula Hort. Soc.* [*Del.*] *Trans., 50 (1936), pp. 55–59, figs. 3*).—As shown by the Delaware Experiment Station, "when hydrated lime is combined with zinc sulfate a heavy precipitate results, and when hydrated lime is combined with both acid lead arsenate and zinc sulfate the hydrated lime reacts with both materials to produce a heavy, conspicuous precipitate. When these three materials are combined with a wettable sulfur the heavy precipitate completely destroys the dispersion of the sulfur particles and they are carried down with the precipitate. As indicated by laboratory adherence and toxicity tests, this heavy precipitate is directly responsible for the increased adherence and fungicidal toxicity of the combination spray films over wettable sulfur spray films alone after rain tests (washings)."

Diseases and insects of small fruits, C. R. CROSBY, W. D. MILLS, and J. A. EVANS (*N. Y. State Col. Agr., Cornell Ext. Bul. 306, rev. (1937), pp. 33, figs. 2*).—This is a handbook of general information.

A new fungus on Ficus nitida Thunb., J. A. JUMP (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *21 (1937), No. 4, pp. 573–575, pl. 1*).—*Hypoxylon borinquensis* n. sp., forming unusually large stromata on the branches and trunk of its host, is described and illustrated.

Controlling brown rot in citrus fruits and foliage, H. S. FAWCETT and L. J. KLOTZ (*Citrus Leaves, 17–B (1937), No. 10, pp. 3, 29*).—Control measures are summarized in this contribution from the California Citrus Experiment Station.

Effect of zinc applications on the crop of grapefruit trees affected with mottle-leaf, E. R. PARKER (*Hilgardia* [*California Sta.*], *11 (1937), No. 2, pp. 35–53, figs. 10*).—Mottle-leaf was found to affect greatly both total yield and quality of the fruit. Sprayed with zinc preparations at the start of the blooming period, a typical orchard previously moderately affected responded during the first season with normal growth and increase in the fruit set. The fruits were also larger, and the commercial grade was improved. Severely affected trees responded most strikingly to treatment, the growth and foliage characteristics becoming normal within a few weeks and the crop the following season being increased several hundred percent. In contrast to the badly affected, untreated trees, the fruit produced by comparable treated trees was normal in size and shape and more pleasing externally. Resinlike formations in the albedo were lacking, and such fruit had a thinner rind and contained more juice. Hydrocyanic acid fumigation injury occurred on the small fruits of severely affected but not on comparable fruits of treated trees.

"The degree of response as measured by the quantity and quality of the crop produced was found to be related to the severity of the symptoms, all treated trees apparently losing for a time the symptoms of mottle-leaf and the cropping limitations imposed by it. The results are in accord with the

view that zinc treatment is specific for mottle-leaf. They suggest that, in the absence of leaf symptoms, zinc treatment will have little, if any, effect on the size and quality of the crop produced."

Grapefruit yield, quality as influenced by mottle leaf, and zinc treatment, E. R. Parker (*Calif. Citrogr., 23 (1937), No. 1, pp. 14, 16, fig. 1*).—This is a summary of the studies reported upon more fully above.

Investigations on the cause of decline disease in date palms, D. E. Bliss (*Date Growers' Inst. Rpt., 11 (1934), pp. 4–6*).—In this study by the California Citrus Experiment Station, *Omphalia* sp. was found in decline-diseased palms but never in healthy ones, and following experimental inoculations lesions on underground parts resembling those on spontaneously affected trees in the field were produced. Healthy palms set in soil infested with this fungus developed the disease within 5 yr. Because the fungus is apparently responsible for root decay in decline-diseased palms, the lesions induced are a specific diagnostic character. Such symptoms of disease as the premature death of leaves, growth retardation, and unfruitfulness may be secondary to the root necrosis. If this be true, *Omphalia* sp. may be considered the primary cause of the decline disease.

Soil disinfection as a means of combating decline disease in date palms, D. E. Bliss (*Date Growers' Inst. Rpt., 12 (1935), pp. 13–16*).—Based on the literature and on experimental work here reported by the California Citrus Experiment Station, soil disinfection is considered at present the most promising means of combating decline disease in areas where the infection threatens to spread to adjoining healthy palms. Although rather expensive, carbon bisulfide acts quickly and then escapes from the soil, leaving no harmful residue.

The spread of decline disease in date palms, D. E. Bliss (*Date Growers' Inst. Rpt., 14 (1937), pp. 4–8*).—This contribution by the California Citrus Experiment Station summarizes previous work on the disease and shows that two species of *Omphalia* are involved in its etiology, that the mycelium apparently grows through the soil from tree to tree, and that it is carried on diseased palms and their offshoots. The fungus was demonstrated on roots of apparently healthy trees on the margin of decline areas, indicating that the first phase of the disease is confined to the roots. Factors involved in its epidemiology are discussed, and its eradication by soil disinfection and use of healthy offshoots for planting are suggested as measures limiting its spread.

Rhizosis, a recently discovered disease of date palms, D. E. Bliss (*Date Growers' Inst. Rpt., 13 (1936), pp. 4–6*).—Rhizosis, first observed in 1933 and known only on date palms in the Coachella Valley, is characterized by a rapid wilting and dying of the leaves and fruit stalks and necrosis of the roots. In this study by the California Citrus Experiment Station, *Ceratostomella* sp. was isolated from affected trees and shown to be highly pathogenic and to reproduce the symptoms experimentally. A preliminary soil disinfection test indicated that this fungus is more difficult to kill in buried root segments by certain soil fungicides than are *Omphalia* sp. and *Armillaria mellea* under similar conditions.

A decay of ornamental cacti caused by Aspergillus alliaceus, J. J. Taubenhaus and G. E. Altstatt (*Mycologia, 29 (1937), No. 6, pp. 681–685, fig. 1*).—In this contribution by the Texas Experiment Station, "*A. alliaceus* is recorded as causing a pad decay of several species of ornamental cacti. This is believed to be the first record of the organism causing a decay of cultivated plants in the United States. The disease was reproduced by artificial inoculation on normal cactus pads, using either spores or sclerotia of the fungus as the source of inoculum. Successful inoculation occurred only when the organism was introduced through needle pricks. *A. alliaceus* was also shown to be able to cause a decay of several mature fruits and vegetables at room temperature.

As with the inoculations on cacti, infection resulted only when the spores or the sclerotia of the fungus were introduced through needle pricks." In a small test with 4-4-50 bordeaux mixture, spraying both plants and soil gave promising results.

Report on experiments to control leaf spot on irises, K. E. MAXWELL (*Florists' Rev., 80 (1937), No. 2072, pp. 24, 25, fig. 1*).—In these cooperative experiments by Cornell University and the Nassau County (N. Y.) Farm Bureau, substantial reductions of infection with *Didymellina macrospora* were obtained by bordeaux mixture (4-4-50) or flotation sulfur (4-50), with addition of potassium rosin soap or potassium fish oil rosin soap as wetter and spreader. Three bordeaux applications with the latter spreader injured some varieties, but the first proved satisfactory for use with bordeaux. Sulfur dust was less effective than an equal number of spray treatments.

Observations indicated large differences in varietal susceptibility.

Recent findings pertaining to the use of sulfuric acid for the control of damping-off disease, S. A. WILDE (*Jour. Forestry, 35 (1937), No. 12, pp. 1106-1110*).—This study by the Wisconsin Experiment Station "throws new light upon the problem of the use of sulfuric acid as a disinfectant in forest nurseries. It emphasizes the importance of the concentration of the solution, its rate of application, and the modifying influence of several soil properties which may be responsible for failure of the treatment or destruction of nursery stock. Experience in several Wisconsin nurseries has shown that sulfuric acid is the cheapest and one of the most reliable disinfectants for the control of damping-off disease, provided it is used on suitable soils, in adequate amounts, and in proper dilution."

Blister rust activities in California, 1936, G. A. ROOT (*Calif. Dept. Agr. Bul., 25 (1936), No. 4, pp. 622-624*).—This cooperative report by the U. S. D. A. Bureau of Entomology and Plant Quarantine, the California Department of Agriculture, the State Division of Forestry, and the University of California discusses the progress made in blister rust control in the State, together with data on the discovery of the disease on the currant host (1935) and on a survey of pines (1936) indicating diseased trees, currants, and gooseberries at several points, and followed by an intensive scouting campaign bringing to light sugar pine infestations in southern Oregon and California. The rust is said to be attacking sugar pine in the same manner that it kills western white pine, viz, through the development of cankers on such a large number of lateral branches that starvation results and death quickly follows from that cause.

A list of Missouri fungi with special reference to plant pathogens and wood-destroying species, W. E. MANEVAL (*Missouri Univ. Studies, 12 (1937), No. 3, pp. 150*).—The previously published list of wood-destroying fungi has been noted (E. S. R., 57, p. 146). The present annotated list, a contribution by the University of Missouri based mainly on a study of actual specimens or of the literature (526 titles given), includes principally the wood-destroying fungi and other plant pathogens, but also a small number of saprophytes and of diseases due to viruses or to physiological or environal conditions. The list is arranged alphabetically, and a host index is provided. Nearly 1,200 definitely identified species and varieties of organisms are listed, and in addition 90 others identified only as to genera. Of the former group there are 4 nematodes, 39 bacteria, 4 Myxomycetes, 45 Phycomycetes, 188 Ascomycetes, 510 Basidiomycetes, 394 Fungi Imperfecti, and 7 Mycelia Sterilia. In addition there are listed 21 virus diseases on 18 hosts, and 29 so-called physiological diseases, making a total of 1,331 organisms and diseases on about 700 different hosts.

Nutritional characteristics of certain wood-destroying fungi, Polyporus betulinus Fr., Fomes pinicola (Fr.) Cooke, and Polystictus versicolor Fr., H. H. LAFUZE (*Plant Physiol., 12 (1937), No. 3, pp. 625–646, figs. 2*).—The nutrition of these fungi was studied by observing their growth on qualitatively varied artificial media, on media containing phenolic compounds, aqueous extracts of woods, and oxidation-reduction and pH indicators, and on wood.

Certain nutritional characteristics proved to be common to all three species, while in other respects wide differences occurred—all discussed in detail. Among the differences, the presence of a strong oxidase system was recognized in *P. versicolor*, while oxidases were very weak in *F. pinicola* and not detectable in *Polyporus betulinus*. Reductases were especially abundant in the last two, but appeared to be weak in the first species.

The possible causes of specificity in these fungi on wood in nature are the absence of essential nutrients and the presence of toxic substances in woods which may affect their initial development, respiration, or fructification. "It was possible to distinguish physiologically between these (1) gymnosperm-inhabiting and angiosperm-inhabiting fungi, (2) white rot-producing and brown rot-producing fungi, and (3) fungi specific and those not specific for certain woods in nature."

Factors affecting the pathogenicity of Fomes lignosus Klotzsch, J. G. HARRAR (*Minnesota Sta. Tech. Bul. 123 (1937), pp. 28, figs. 9*).—*F. lignosus*, a tropical fungus causing root rot of rubber (*Hevea brasiliensis*), is a facultative parasite with wide host range (listed) and distribution throughout the tropics. Its taxonomy has long been disputed, some 34 synonyms having been used. Both large and small hyphae are produced, anastomoses are common, and clamp connections are very numerous. The binucleate cells predominate over the multinucleate. There were no sporophores in culture, but imperfect chlamydospore-like structures were formed. Hyphal tip cells often produced spore-like structures behaving as sclerotia. Under a number of conditions rhizomorphic strands were formed.

The temperature range was 2°–36° C., with an optimum of 27°–30°. Growth occurred at pH 4–10+, the optimum being pH 6–7.5. Strand formation was induced by alkaline media. The fungus grew equally well in daylight or darkness, and growth under blue, red, or yellow rays alone did not differ significantly. At optimum temperatures direct daylight was lethal, and ultraviolet in small quantities induced distorted growth and (apparently) abortive sporophores.

The common fertilizer practices, as tested in pot experiments, had no significant direct effect on the development of the fungus in the soil. Many organic mercury dusts proved extremely toxic to the parasite, New Improved Ceresan proving effective at the rate of 1–200,000. The possibility of biological control was tested in a limited way, and is discussed, though no final conclusions are as yet deemed justified. As to the pathogenicity of *F. lignosus*, study of a large number of strains from various localities is deemed very necessary to a full understanding of the problem.

Observations on the length of dormancy of certain plant-infesting nematodes, C. W. McBETH (*Helminthol. Soc. Wash. Proc., 4 (1937), No. 2, p. 53*).—Data on the dormancy are discussed and tabulated for *Ditylenchus dipsaci* and *Tylenchus balsamophilus* on various hosts.

The feeding of some hollow-stylet nematodes, M. B. LINFORD (*Helminthol. Soc. Wash. Proc., 4 (1937), No. 2, pp. 41–46*).—This paper by the [Hawaiian] Pineapple Producers' Experiment Station describes the technics used and reports details omitted from a preliminary paper previously noted (E. S. R., 77, p. 65). It also considers the feeding habits of three fungus-sucking species (including *Ditylenchus intermedius*) and briefly reports observations on the feeding of the

root knot nematode (*Heterodera marioni*). Among the seven genera of hollow-stylet nematodes seen feeding, all used the stylet in puncturing and all held it protruded far into the food organism during the ingestion period. Penetration of a plant cell or of animal prey by a stylet is accomplished only when the nematode and its food object are held in some medium which offers sufficient resistance so that the force required to puncture can be applied.

Notes on the feeding of Ditylenchus dipsaci (Nematoda: Tylenchidae), M. B. LINFORD (*Helminthol. Soc. Wash. Proc., 4 (1937), No. 2, pp. 46, 47*).—This study by the [Hawaiian] Pineapple Producers' Experiment Station indicates that *D. dipsaci* uses its stylet for puncturing plant cells and feeds with its stylet protruded. This plant parasite was also found able to feed on fungi, but the data are still too limited to determine the extent to which such feeding may favor its long survival in soils devoid of higher plants.

The nematode Ditylenchus dipsaci (Tylenchidae) in tulip leaves, G. S. COBB (*Helminthol. Soc. Wash. Proc., 4 (1937), No. 2, p. 48*).—Leaves of tulips growing on Long Island were found infested with this nematode, a first report on this host in the United States.

Experiments to determine the nematocidal qualities of beta naphthol, colloidal arsenate of lead and colloidal sulphur, C. W. MCBETH (*Helminthol. Soc. Wash. Proc., 4 (1937), No. 2, pp. 53, 54*).—In tests with a soil heavily infested with the sugar beet nematode (*Heterodera schachtii*) and free-living nematodes, β-naphthol proved the superior nematocide, but the high cost of all three materials renders them economically impractical for field use.

The formation and operation of the traps in the nematode-catching fungus, Dactylella bembicodes, Drechsler, J. N. COUCH (*Jour. Elisha Mitchell Sci. Soc., 53 (1937), No. 2, pp. 301–309, pl. 1*).—The nematode traps were found to be produced when the fungus described was grown on acid media. The nematodes were also isolated and grown on agar in the presence of bacteria as food, and addition of the green alga *Chlorella* to the cultures kept them in a healthy condition for a longer time. When a nematode thrust its head or tail into one of the fungus rings (traps) it closed practically instantaneously by simultaneous swelling of the three cells of the ring. Partial closure was induced by mechanical irritation of the ring, and a slight closure was also induced in a few rings by lactic acid solution. Complete and instantaneous closing was induced by heat (dry or as warm water or steam). Water at 33°–75° C. applied to the rings caused instantaneous and complete closure, but water above 80° failed to do so, the high temperature perhaps inactivating the colloids. Examination of the swollen loop cells showed a highly refractive gelatinous substance therein, the substance believed to cause the swelling. The nature of the reaction with nematodes is not yet known, but it is assumed that the latter give off a chemical substance inducing the swelling. After the nematode has been caught, the fungus hyphae invade and destroy its body, using it as food. The suggestion of biological control of soil nematodes by this fungus is advanced.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Transactions of the Second North American Wildlife Conference (*Washington, D. C.: Amer. Wildlife Inst., 1937, pp. VIII+661, figs. 24*).—This report of the transactions of the second conference on North American wildlife (E. S. R., 76, p. 354), held at St. Louis, Mo., in March 1937, is presented in three parts, the first relating to general sessions (pp. 1–205), which were addressed by Secretary of Agriculture H. A. Wallace, the second (pp. 207–261) being a report of the general wildlife federation meeting, and the third (pp. 263–661) dealing with contributions presented at special sessions.

Among the contributions presented are the following: The Waterfowl Situation, by F. C. Lincoln (pp. 168–179); Development and Maintenance of Food and Cover—Where and by Whom? by R. Bennitt (pp. 264–267); Making Erosion Control Benefit Wildlife, by R. D. Stevens (pp. 268–275); Utilization of Browse by Wildlife, by O. Julander (pp. 276–287); Inter-relationships of Range Animals, by C. T. Vorhies (pp. 287–294); The Beaver—Conserver of Soil and Water, by W. L. Finley (pp. 295–297); Disease Relationship of Domestic Stock and Wildlife, by J. E. Shillinger (pp. 298–302); Research Studies in the Control of Destructive Mammals, by F. E. Garlough (pp. 303–310); Further Studies of Wildlife Cycles, by L. W. Wing (pp. 326–339); Vermont's Pheasant Situation, by G. Wallace (pp. 340–345); Grazing in Relation to the Nesting of the Blue-wing Teal [*Querquedula discors*], by L. J. Bennett (pp. 393–397); The Importance of Lead Poisoning in Waterfowl, by J. E. Shillinger and C. C. Cottam (pp. 398–403); Disease Factors in Reported Cases of Starvation in Waterfowl, by E. R. Kalmbach and D. R. Coburn (pp. 404–410); Habitat Requirements of Stream-Dwelling Muskrats [*Ondatra zibethica*], by P. L. Errington (pp. 411–416) (Iowa Experiment Station); A Food Study of the White-Tailed Deer, by L. C. Stegeman (pp. 438–445); The Dependence of Soils on Animal Life, by W. R. Van Dersal (pp. 458–467); Natural Vegetation in Soil Conservation and Wildlife Management, by H. L. Whitaker (pp. 468–475); Tragedy of Upland Game Birds Throughout the West and Southwest, by J. S. Ligon (pp. 476–480); Hungarian Partridge [*Perdix perdix perdix*] Nesting Studies at Faville Grove, by A. S. Hawkins (pp. 481–484); The Chukor Partridge in California, by A. Bade (pp. 485–489); The Reeves Pheasant in New York, by F. C. Edminster (pp. 490–493); Wild Turkey Management on the Missouri Ozark Range, by H. L. Blakey (pp. 494–498); Notes on the Gray and Fox Squirrels [*Sciurus carolinensis carolinensis* and *S. niger limitis*] of Eastern Texas, by P. Goodrum (pp. 499–504); The Status of the Ringneck Pheasant in Pennsylvania, by R. Gerstell (pp. 505–511); A Preliminary Report of the New England Cottontail [*Sylvilagus transitionalis*] Studies, by P. D. Dalke (pp. 542–548); The Mearn's Cottontail [*Sylvilagus floridanus mearnsi*] in Iowa, by G. O. Hendrickson (pp. 549–554); Sylvatic Plague, by A. M. Day (pp. 555–560); Mammal Relationships to Upland Game and Other Wildlife, by E. V. Komarek (pp. 561–569); Quail and Cover on Three Central Texas Farms, by V. W. Lehmann (pp. 570–574); Some Relations of Bobwhite Quail to Second-Growth Pine Woodland in Walker County, Texas, by D. W. Lay (pp. 575–578); The Blue Jay as Link Between Acorn and Quail, by D. W. Lay and H. R. Siegler (pp. 579–581); Woodcock Management Studies in Maine, by C. M. Aldous (pp. 582–588); The Controlled Hunting Areas and the Pheasant Refuge Management System in Northwestern Ohio, by L. E. Hicks (pp. 589–598); and An Inventory of Threatened and Vanishing Species, by R. H. Pough (pp. 599–604).

[Contributions on wildlife research and management] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Res. and Mangt. Leaflets BS–91 (1937), pp. 12, figs. 3; BS–92, pp. 4; BS–93, pp. 10, fig. 1; BS–94, pp. 15; BS–95, pp. 20, pls. 6; BS–96, pp. 4; BS–97, pp. 31; BS–98, pp. 8; BS–99, pp. 8; BS–100 (1938), pp. 20; BS–101, pp. 6, pl. 1; BS–102, p. 1; BS–103, pp. 9; BS–104, pp. 30*).—Further contributions in this series (E. S. R., 77, p. 652) are as follows: Research Studies in the Control of Destructive Mammals, by F. E. Garlough (BS–91); The American Chameleon [*Anolis carolinensis*] and Its Care (BS–92); The Controlled Hunting Areas and the Pheasant Refuge-Management System in Northwestern Ohio, by L. E. Hicks (BS–93); Status of Eelgrass (*Zostera marina*) on the North Atlantic Coast, January 1937, by J. J. Lynch and C. Cottam (BS–94) (E. S. R., 74, p. 511); Preserves and Ranges Maintained for Buffalo and Other Big Game, by C. Ruth (BS–95); Blackbirds and the Rice Crop on the

Gulf Coast, by E. R. Kalmback (BS-96); Abstract of Fur Laws, 1937-38, compiled by F. G. Grimes (BS-97) (E. S. R., 76, p. 356); Colleges and Universities Offering Courses in Wildlife Management, 1937-38 (BS-98); Disease as a Factor in Game Fluctuation, by J. E. Shillinger (BS-99); Annotated List and Index of Leaflets BS-1 to BS-100, by W. L. McAtee (BS-100); Principles of Breeding Rabbits (BS-101) and Salt Requirements of Rabbits (BS-102), both by G. S. Templeton; Facts About Snakes (BS-103); and The Status of Wildlife Research—1937, by W. L. McAtee (BS-104).

Wildlife and the land: A story of regeneration (*Washington: Govt., 1937, pp. II+90, figs. 16*).—This is a report of the Special Committee on Conservation of Wildlife Resources, appointed under U. S. Senate Resolution No. 246 of the Seventy-first Congress.

The book of wild pets, C. B. Moore (*New York: G. P. Putnam's Sons, 1937, pp. XII+553, figs. [319]*).—A discussion of the care and feeding of native wildlife in captivity, together with notes on their identification and life habits.

[Work in fish and game management by the Oregon Station] (*Oregon Sta. Bul. 350 (1937), pp. 23, 24*).—Brief reference is made to the work of the biennium 1935-36, conducted in cooperation with the U. S. D. A. Bureau of Biological Survey and the American Wildlife Institute, on small game in the Willamette Valley, artificial incubation of pheasants, and water as a limiting factor in the management of antelope in the State.

[Game management work by the Wisconsin Station] (*Wisconsin Sta. Bul. 439 (1937), pp. 49-52, figs. 2*).—A study made of the comparative value of different grains for winter game feeding, by A. S. Hawkins, E. B. Moore, and A. Leopold; game cover, by Leopold, Hawkins, and D. E. Wade; and movements of marked birds, by Leopold, Hawkins, and O. S. Lee, are briefly considered.

The moose of Isle Royale, A. Murie (*Mich. Univ., Mus. Zool. Misc. Pub. 25 (1934), pp. 44, pls. 7*).—An account is given of the history, life, habits, insect enemies, accidents and disease, breeding and feeding, depletion of range, and management of moose, as studied on Isle Royale, a body of land varying from 4 to 8 miles in width, approximately 45 miles long, with an area of about 220 sq. miles, lying more or less parallel to the north shore of Lake Superior and 13 miles from the Canadian side at its closest point.

Fur farming, A. R. Harding, rev. by L. H. Adams (*Columbus, Ohio: A. R. Harding Pub. Co., 1936, rev., pp. 442, figs. 92*).—A revision of this summary on fur-bearing animals, enclosures, habits, care, etc. (E. S. R., 21, p. 750).

A new rat trap and how to lay it, L. E. Hachero (*Philippine Jour. Agr., 8 (1937), No. 3, pp. 341-349, figs. 3*).—An account is given of a new rat trap, the general feature of which is based upon the principle of pitfall trap construction.

[Contributions on ornithology and herpetology] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 4, pp. 491-522, 539-566, pls. 5*).—Contributions on herpetology and ornithology here presented include the following: Two Early Puerto Rican Herpetologists—I, Dr. Augustin Stahl, and II, Dr. Francisco del Valle Atiles (pp. 491-501), and Herpetological Notes With New Species From the American and British Virgin Islands, 1936 (pp. 503-522), both by C. Grant; Ornithological Investigations in Vieques Island, Puerto Rico, During December 1935, by S. T. Danforth (pp. 539-550); and Nesting of the Puerto Rican Oriole [*Icterus portoricensis*] (pp. 551-558) and Some Observations on the Nesting Habits of Adelaide's Warbler [*Dendroica adelaidae*] (pp. 559-566), both by N. G. Spaulding.

The book of birds, I, II, edited by G. Grosvenor and A. Wetmore (*Washington, D. C.: Natl. Geogr. Soc., [1937], vols. 1, pp. VIII+356, [pls. 104, figs. 133]; 2, pp. 374 [pls. 100, figs. 108]*).—This work, to which more than eleven authors have contributed, presents descriptions and full-color illustrations of

all the major species occurring in the United States and Canada. The 950 color portraits are by A. Brooks.

Life history of the oven-bird in southern Michigan, H. W. HANN (*Wilson Bul., 49 (1937), No. 3, pp. 145–237, figs. 25*).—A study of the life history of *Seiurus aurocapillus* in Michigan for a period of 5 yr., with references to the literature (a list of 75 titles to which is included), is reported upon. The food for the newly hatched young is said to consist of geometrid larvae and small earthworms, with adult insects later on.

The birds of the Philippine Islands, with notes on the mammal fauna, II–IV, MARQUESS HACHISUKA (*London: H. F. & G. Witherby, 1932, [vol. 1], pt. 2, pp. 169–439+XX, pls. 15, figs. 11; 1934, [vol. 2], pt. 3, pp. 256, pls. [41], [figs. 34]; 1935, vol. 2, pt. 4, pp. XXXI+257–469, pls. 21, figs. 11*).—Part 2 of volume 1 of this work, of which part 1 has been noted (E. S. R., 65, p. 545), deals with the orders Columbiformes, Ralliformes, Pygopodiformes, Tubinariformes, Telmatoformes, Ardeiformes, Anseriformes, and Pelecaniformes. Parts 3 and 4, which compose volume 2, deal with the orders Accipitriformes to Passeriformes (Timaliidae), the remaining families of which latter order will be dealt with in volume 3. Indexes accompany both volumes.

Some returns of banded birds, M. T. COOKE (*Bird-Banding, 8 (1937), No. 4, pp. 144–155*).—The returns of 57 species of banded birds are reported in this contribution from the U. S. D. A. Bureau of Biological Survey.

Snakes of Maryland, H. A. KELLY, A. W. DAVIS, and H. C. ROBERTSON (*Baltimore: Nat. Hist. Soc. Md., 1936, pp. 103, pls. [12], figs. [34]*).—Descriptive accounts and illustrations, including 11 in colors, are given for 28 forms of snakes occurring in Maryland. A map showing the spotted distribution of species and keys to nonvenomous, venomous, and young snakes are included.

[Lake water bacteria as fish food] (*Wisconsin Sta. Bul. 439 (1937), pp. 58, 59*).—A study of the factors that control the number of bacteria in lake waters in their relation to fish food was made by W. H. Stark, E. McCoy, E. A. Birge, and C. Juday.

An introduction to nematology, sect. 1, pt. 1, B. G. and M. B. CHITWOOD (*Baltimore: Monumental Ptg. Co., 1937, sect. 1, pt. 1, pp. [3]+53, figs. 53*).—This treatise on nematology, which will be published as a series of 10 numbers, several chapters being contained in each number, has been handled from a comparative standpoint and is divided into 3 sections, namely, anatomic, ontogenetic, and systematic. The introductory and 3 additional chapters which appear in this first number include bibliographies. An outline classification of Nematoda is included.

***Observation on the morphology and life history of Gaigeria pachyscelis* Raill. and Henry 1910, a hookworm of sheep and goats,** R. J. ORTLEPP (*So. African Jour. Sci., 33 (1936), pp. 875, 876*).—This is an abstract of a contribution on *G. pachyscelis*, a very common parasite of sheep in South Africa and also found in the Congo, India, and Java, presented at the annual meeting of the South African Association for the Advancement of Science held in Johannesburg in October 1936. In South Africa, where sheep and goats serve as hosts, it is practically confined to the more arid regions, namely, South-West Africa, northwestern Cape of Good Hope, western Transvaal, and Bechuanaland, where it is one of the most serious parasites affecting the sheep industry.

The larvae during their free life pass through three stages, each of which is separated by a molt. Infection of the host is shown to be through the skin, and all attempts at bringing about an infection through the mouth have been unsuccessful. After entering the skin, the larvae proceed to the lungs, presumably via the blood stream and heart. In the lungs they remain about

14 days, during which time the third-stage larvae grow, molt, and pass into the fourth stage. The larvae leave the lungs from the thirteenth day onward, and, traveling up the bronchi and trachea, reach the mouth, where they are swallowed and so reach the small intestine. Here the larvae grow and, in about a week, prepare to undergo another molt and pass into the final or fifth stage. After molting the adolescent parasites continue to grow, the sex organs become mature, and the worms become fully grown and begin to pass eggs from about the tenth week after infection.

[Work in entomology and zoology by the Alabama Station, 1934–35 and 1936] (*Alabama Sta. Rpts. 1934–35, pp. 21, 22, 23; 1936, pp. 25–27*).—Control of citrus insects with oil emulsions and the effectiveness of powdered derris root with various carriers against the citrus white fly, both by L. L. English; the relative speed of toxic action of various arsenates for insects with reference to their control, and the occurrence and control of the pecan weevil, both by H. S. Swingle; and bollweevil control with calcium arsenate, by J. M. Robinson and F. S. Arant, are referred to in the report for 1934–35 (E. S. R., 74, p. 661). For 1936 observations of the biology and control of the vegetable weevil, by Robinson; life history and control of the cowpea curculio, by Arant; production of food for fresh-water fish, by Swingle, E. V. Smith, and G. D. Scarseth; physiology of insects with reference to their control, by Swingle; and the rate of fertilizing cotton with and without poisoning, by E. L. Mayton and Robinson, are briefly referred to.

[Work with economic insects by the Oregon Station] (*Oregon Sta. Bul. 350 (1937), pp. 34, 40–46, 53, 61, 67, 68, figs. 2*).—The work of the biennium 1935–36 in entomology briefly reported (E. S. R., 73, p. 72) includes spray investigations with oil emulsions and oil-water mixtures, spreaders, and wettable sulfur, the pear thrips on prunes, strawberry crown moth, blackberry mite control (E. S. R., 75, p. 233), strawberry fruitworm, insect carriers (strawberry aphid) of crinkle in strawberries, seasonal habits and control of the potato flea beetle, Rocky Mountain spotted fever tick, codling moth, calcium arsenate as a substitute for lead arsenate in codling moth control, western spotted cucumber beetle, cherry fruitfly, pea aphid, pea weevil, effect of dormant oil sprays on pear trees, two-spotted mite, and tomato fruitworm (bollworm).

[Contributions on entomology in Puerto Rico] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 4, pp. 523–538, 567–571, 577–583, pls. 2*).—Contributions here presented include the following: New or Little-Known Species of West Indian Tipulidae (Diptera), III, by C. P. Alexander (pp. 523–534) (E. S. R., 78, p. 73); Two Insects New to Puerto Rico: The Lycid Beetle *Thonalmus chevrolati* Bourgois and the Ephydrid Fly *Ephydra gracilis* Packard, by G. N. Wolcott and L. F. Martorell (pp. 535–538); New Eupterygine Leafhoppers From Puerto Rico (Homoptera: Cicadellidae), by P. W. Oman (pp. 567–571); The Ant *Monomorium carbonarium ebeninum* Forel in a New Role: As Predator on the Egg-Clusters of *Diatraea saccharalis* F. in Puerto Rican Cane Fields, by G. N. Wolcott and L. F. Martorell (pp. 577–579); and The Brackish Water Mosquitoes of Puerto Rico, by G. S. Tulloch (pp. 581–583).

Insect and other pests of 1936, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans., 5. ser., 49 (1937), pp. 111–157, figs. 21*).—This is the usual annual report on the insect and other animal pests (E. S. R., 76, p. 214). Parasites of the red deer (*Cervus elaphus*) considered include the deer warble fly *Hypoderma diana*, nasal botfly *Cephenomyia auribarbis*, castor-bean tick, deer ked *Lipoptena cervi*, and deer biting louse *Trichodectes cervi*.

The historical development of insect classification, H. F. Wilson and M. H. Doner (*[Madison, Wis.]: Authors, 1937, pp. 133, figs. 28*).—This contribution is presented in 17 chapters, references to the literature being given in the text, together with a 3-page list of references not so cited.

A list of the fascicles of "Genera Insectorum," with author and family index, L. H. Townsend (*Rev. Ent., 7 (1937), No. 2-3, pp. 217-230*).—A list is given of the 203 fascicles of Genera Insectorum, accompanied by author and order, family, and subfamily indexes.

Olfactory conditioning in a parasitic insect and its relation to the problem of host selection, W. H. Thorpe and F. G. W. Jones (*Roy. Soc. [London], Proc., Ser. B, 124 (1937), No. 834, pp. 56-81, fig. 1*).—An account is given of experiments with the endosparasite *Nemeritis canescens* (Grav.), an ichneumonid, the normal host of which is the larva of the Mediterranean flour moth. It is pointed out that, while the genus *Ephestia* provides the only known hosts of this parasite in Europe, a race which attacks the wax moth occurs in the United States.

The influence of moonlight on the activity of certain nocturnal insects, particularly of the family Noctuidae, as indicated by a light trap, C. B. Williams (*Roy. Soc. London, Phil. Trans., Ser. B, 226 (1936), No. 537, pp. 357-389, figs. 7*).—This contribution from the Rothamsted Experimental Station reports upon investigations conducted with a view to testing the truth of a general belief that insect night activity in certain groups, particularly Lepidoptera, is reduced at full moon. To this end a light trap was placed in a field at Rothamsted in March 1933 and has since been in continuous use. The captures of the Noctuidae during the summers of 1933, 1934, and 1935 were selected for special study. The results, details of which are presented in tables and figures, have led to the conclusion that lunar effect on the captures is definitely demonstrated, and there is distinct evidence that it differs in different groups apart from any difference in their time of flight. Therefore, it is probably a physiological effect on the activity of the insects and not due merely to reduction in the efficiency of the light trap when the moon is shining.

Toxicological studies of derris: Comparative toxicity and elimination of some constituents of derris, A. M. Ambrose and H. B. Haag (*Indus. and Engin. Chem., 29 (1937), No. 4, pp. 429-431*).—In this further contribution (E. S. R., 78, p. 215) studies of the acute oral toxicity of rotenone, deguelin, toxicarol, dehydrorotenone, and dihydrorotenone for various species of laboratory animals are reported.

"No effects were noted when rotenone was fed to dogs in doses of 2 g per kilogram of body weight. The lethal dose was found to be 3 g for rabbits, 0.6 g for rats, and 0.06 g for guinea pigs. Of the other compounds studied, doses as high as 1.5 g were not fatal to rabbits and rats. Studies on the elimination of these compounds were carried out by means of a colorimetric test. Indications are that these substances are excreted in the feces unchanged. No free rotenone, deguelin, or toxicarol could be isolated from the urine or feces. Dehydrorotenone was isolated from the feces and identified by its melting point. No evidence was found to indicate that any of the substances were eliminated in the urine. There seems to be little danger of acute poisoning from the ingestion of rotenone, deguelin, toxicarol, dehydrorotenone, or dihydrorotenone."

Toxicity of rotenone: A study of the toxicity to humans and animals of rotenone-bearing products, H. B. Haag (*Soap, 13 (1937), No. 1, pp. 112c, 112d, 137*).—The details of an experimental study on the acute toxicity of several powdered derris substances and some of the active constituents, determined on a series of animals by oral feeding under standard laboratory conditions and observation for 15 days, are reported in tables.

The use of honey bees for testing liquid insecticides, F. C. NELSON (*Jour. N. Y. Ent. Soc., 45 (1937), No. 3–4, pp. 341–352, figs. 3*).—An account is given of a method of using honeybees for laboratory testing work with liquid insecticides, the advantages and disadvantages of which are pointed out.

High kill insect sprays, A. E. BADERTSCHER (*Soap, 13 (1937), No. 9, pp. 93, 95, 97, 99, 101, 103, 105, 107, 109, figs. 2*).—A study and discussion of semiconcentrate sprays and the proper method of their evaluation. The details are presented in tables and graphs.

Review of United States patents relating to pest control, [January–December 1937], R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control, 10 (1937), Nos. 1, pp. 12; 2, pp. 9; 3, pp. 12; 4, pp. 9; 5, pp. 11; 6, pp. 11; 7, pp. 11; 8, pp. 10; 9, pp. 8; 10, pp. 11; 11, pp. 13; 12, pp. 9*).—A continuation of this series (E. S. R., 77, p. 68).

Chewing insects affecting field and garden crops, R. HUTSON (*Mich. State Col. Ext. Bul. 180 (1937), pp. 44, figs. 42*).—A practical summary of information.

Insects that carry mosaic disease of sugarcane, J. W. INGRAM (*Sugar Bul., 16 (1937), No. 6, pp. 4–7*).—In addition to the corn leaf aphid, discovered by Brandes in 1920 (E. S. R., 44, p. 49) to be a vector of sugarcane (= corn) mosaic, the rusty plum aphid and the green bug have been found by the author and Summers (E. S. R., 75, p. 811) to carry the disease in Louisiana. The rusty plum aphid has since 1930 been the most common aphid found on sugarcane plants, and the green bug, while not as generally found even as the corn leaf aphid, has been the most common one observed in some sugarcane fields. Mention is also made of other forms suspected of being carriers.

Unlike the mosaic type of diseases of other plants, sugarcane mosaic is shown to be transferred from plant to plant only by insects (except that it is apparently transferred to a small extent by cutting mosaic and healthy cane with the same knife).

Studies of sugarcane insects conducted by the United States Department of Agriculture in Puerto Rico, H. D. TATE and F. M. WADLEY (*Puerto Rico Sta. Agr. Notes No. 83 (1938), pp. 3*).—A brief report is made on work with sugarcane insects conducted in Puerto Rico from August 1935 to June 1936.

Experimental work again demonstrated that sugarcane mosaic can be transmitted by the corn leaf aphid and the rusty plum aphid, and also by the black aphid *Carolinaia cyperi* Ains. In numerous experiments the common yellow aphid *Sipha flava* Forbes failed to transmit the mosaic virus. It is pointed out that the corn leaf aphid, *C. cyperi*, and the rusty plum aphid are widespread in Puerto Rico. The yellow aphid is present in all parts of the island, at all seasons, and on all the principal varieties of sugarcane. Species of mealybugs (*Pseudococcus*) were found present in nearly all fields, becoming very abundant on old or mature cane and being most numerous on the P. O. J. 2878 variety. The sugarcane borer was also found to be widespread and was injurious in many fields.

[Contributions on insect and other animal pests of sugarcane] (*Internatl. Soc. Sugar Cane Technol. Cong. [Brisbane] Proc., 5 (1935), pp. 118–120, 358–405, 436–483, 583–603, pls. 11, figs. 7*).—Contributions presented at the Fifth Congress of the International Society of Sugar Cane Technologists (E. S. R., 70, p. 357), held at Brisbane from August 27 to September 3, 1935, include the following: The Insect Vectors of Virus Diseases of Sugar Cane, by C. E. Pemberton (pp. 118–120) (Hawaiian Sugar Planters' Experiment Station); Investigations on the Cane Beetle Borer *Rhabdocnemis obscura* Boisd. [New Guinea Sugarcane Weevil] and Its Parasite *Ceromasia sphenophori* Vill. in Fiji, by G. L. Windred (pp. 358–378); Biological Control of Sugar-Cane Pests in the British West Indies and British

Guiana, by J. G. Myers (pp. 381–385); A Review of Control Work on *Diatraea saccharalis* F. in Barbados, by R. W. E. Tucker (pp. 386–397); Parasite Introductions: Barbados and Puerto Rico, by R. W. E. Tucker and G. N. Wolcott (pp. 398–404) (P. R. College Station); The Sugar Cane White Grub *Lachnosterna (Phytalus) smithi* Arrow in Mauritius, by L. A. Moutia (pp. 436–445); The White Grub Problem in Puerto Rico, by G. N. Wolcott (pp. 445–456) (P. R. College Station); Control of the "Greyback Cane Beetle" *Lepidoderma albohirtum* Waterh. in North Queensland (pp. 456–464) and A Preliminary Study in Trapping "Greyback" Cane Beetles (pp. 464–469), both by R. W. Mungomery and J. H. Buzacott; The Species of *Diatraea* Attacking Sugar Cane in the New World, by H. E. Box (pp. 470–476); Recommendations for Control of the Sugar-Cane Borer in Louisiana, by W. E. Hinds and B. A. Osterberger (pp. 476–483) (La. Station); Wireworms (Elateridae) and Their Control in Queensland Sugar-Cane Fields, by W. A. McDougall (pp. 583–587); A Short Note on the Breeding of *Bufo marinus* in Captivity, by R. W. Mungomery (pp. 589–591); Recent Control Measures Against *Anomala orientalis* Waterh. in Hawaii, by C. E. Pemberton (pp. 591–593) (Hawaiian Sugar Planters' Station); and The Rat Pest in Cane Areas, by K. R. Gard (pp. 594–603).

Handbook of practicing disinfectors, K. GREIMER, rev. by H. MICHAEL (*Handbuch des praktischen Desinfektors. Dresden: Theodor Steinkopff, 1937, 3. ed., rev., pp. XII+203, figs. 44*).—A practical guide and reference work for use in disinfection and the control of household pests and rodents, which includes contributions by H. Michael, P. Hofmann, A. Schröder, and L. Gassner.

A note on the resistance to prolonged cold of some insect pests of stored products, G. H. MANSBRIDGE (*Roy. Ent. Soc. London, Proc., Ser. A, 11 (1936), No. 6–12, pp. 83–86, figs. 2*).—A list is given of species representing 16 families of Lepidoptera and Coleoptera in which the effect of low winter temperatures is shown. It was found that under natural conditions the following insects can survive a winter when the temperature falls to −2° C.: The tobacco moth, the Mediterranean flour moth, the Indian-meal moth, *Borkhausenia pseudospretella*, the webbing clothes moth, *Laemophloeus turcicus*, the varied carpet beetle, the larder beetle, *Trogoderma granarium*, *T. versicolor*, *Gibbium psylloides*, the golden spider beetle, *Ptinus tectus*, the yellow mealworm, and the dark mealworm.

Pest control in rural warehouses and suggested improvements, D. B. MACKIE and W. B. CARTER (*Calif. Dept. Agr. Bul., 26 (1937), No. 3, pp. 275–293, figs. 6*).—The results of observations of some grain storage pests, with particular reference to their control in rural warehouses, are reported.

A survey of the progress in mothproofiing during 1928–1936, C. O. CLARK (*Jour. Textile Inst., 27 (1936), No. 12, pp. P389–P394*).—A review of the progress in mothproofing, presented with a list of 41 references to the literature.

The biological control of the weed Clidemia hirta, commonly known in Fiji as "the curse", H. W. SIMMONDS (*Agr. Jour. [Fiji], 8 (1937), No. 3, pp. 37–39*).—A brief history is given of the melostomaceus plant *C. hirta*, accidentally introduced from Brazil with coffee plants, which became a serious pest in Fiji, and its control by *Liothrips urichi*, the introduction of which thrips from Trinidad was successfully accomplished in March 1930. Control was effected through its attacks upon the terminal shoots with a resulting stunting of the weed, which then became overgrown and strangled by competing vegetation. In most places the weed has been replaced with useful grasses, para, etc., sensitive, and *Desmodium*. At one place a good deal of blue rattail was noticed, while at another *Urena lobata*, another weed, was in evidence.

Termite control: Exaggeration of damage in reports of zealous control operators—much yet to be learned about control methods, N. TURNER (*Soap, 13 (1937), No. 4, pp. 101, 103, 105, 107*).—A practical contribution from the Connecticut [New Haven] Experiment Station.

Magnesium sulfate, an unsatisfactory substitute for arsenicals in grasshopper baits, R. C. SMITH (*Science, 86 (1937), No. 2227, pp. 226–228*).—Field tests of Epsom salts as a substitute for arsenicals in grasshopper baits conducted by the Kansas Experiment Station failed to confirm the findings reported by Frings and Frings (E. S. R., 77, p. 659). They led to the conclusion that for the present Epsom salts cannot be recommended as a satisfactory control for any insect.

Time required for food passage through the alimentary tract of the cockroach Periplaneta americana Linn., B. T. SNIPES and O. E. TAUBER (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 277–284, fig. 1*).—Using banana paste slightly sweetened with cane sugar and colored with carmine, Congo red, or ultramarine blue as test food, the egestion time for 100 individuals of the American cockroach averaged 20.6±6.2 hr., with a range from 9.1 to 33.4 hr. In spite of rapid passage through the crop by the greater part of a meal, traces of test food have been found in this organ as long as 100 hr. after ingestion.

Experimental crossing of subspecies in Nemobius (Orthoptera: Gryllidae), B. B. FULTON (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 201–207, figs. 2*).—The evidence from crossing experiments and observations here reported indicates that the species *N. fasciatus* (DeG.) is divided into three physiological or ecological races, all of which occur throughout most of the geographical range of the species. The races are segregated by habitat, although some overlapping of territory occurs, and it is probable that they do not interbreed.

Observations on Grylloblatta campodeiformis Walker, H. B. MILLS and J. H. PEPPER (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 269–275, pl. 1, fig. 1*).—Contributing from the Montana Experiment Station, the authors report upon the orthopteroid *G. campodeiformis*, which was first discovered in the vicinity of Bozeman in the autumn of 1936. It was collected at isolated stations in Gallatin County from beneath rocks, logs, and other debris on the ground, at elevations varying from 5,400 to 8,600 ft., and is largely solitary. It is a voracious feeder, in captivity eating flies, bread crumbs, and decaying vegetable matter. The optimum temperature, or that at which it came to rest when given its choice, was 3.7° C. (38.7° F.). Normal activity occurred at from 0.1° to 15.7°. It succumbed to cold prostration at −6.2° and heat prostration at 27.8°. All of these points are lower than in the case of most common insects.

Some recent advances in research on locust problems, J. C. FAURE (*So. African Jour. Sci., 33 (1936), pp. 797–811, figs. 15*).—This contribution is presented with maps and references to the literature.

A biometrical study of the adult components of Philippine locust swarms, L. B. UICHANCO and R. B. GINES (*Philippine Agr., 26 (1937), No. 3, pp. 237–289, figs. 10*).—A report is made of a study of 49 lots, aggregating 19,619 adult locusts, which were collected from swarms occurring in various parts of Luzon, Visayas, and Mindanao in the years 1932–36, inclusive, during the height of the present outbreak cycle.

British grasshoppers and their allies: A stimulus to their study, M. BURR (*London: Philip Allan & Co., 1936, pp. XVI+164, pls. 6, [figs. 98]*).—A practical, illustrated handbook which includes 40 maps illustrating the distribution of Orthoptera in The British Isles.

The greenhouse thrips on oranges, A. M. BOYCE and J. MABRY (*Calif. Citrogr., 23 (1937), No. 1, pp. 19, 20, 28, 29, figs. 2*).—A preliminary study conducted by

the California Citrus Experiment Station as to the biology and control of the greenhouse thrips, which came into prominence as a pest of considerable importance on Valencia oranges at Rancho Santa Fe, Calif., during the summer of 1936, is reported upon.

Laboratory tests of the efficiency of various materials have shown that "pyrethrum, nicotine sulfate, dinitro-*o*-cyclohexylphenol, and lethane (a proprietary aliphatic thiocyanate compound) applied in various types of dust mixtures were very effective in killing thrips. Rotenone-bearing dust mixtures were relatively low in effectiveness in our tests. Field tests with these materials resulted in very high initial kills with pyrethrum and dinitro-*o*-cyclohexylphenol, while the other materials gave either variable or poor kills. The field tests illustrated the fact that at the present time the control of this thrips on oranges with available materials applied as dust is likely to be impractical. This statement is based on the fact that none of the materials under consideration afford[s] sufficient residual toxic action to kill the thrips that hatch following treatment, which necessitates repeated treatments at rather short intervals. . . . Present information indicates that the addition of 0.5 percent light medium, highly refined petroleum oil is desirable. The suggested control program for the coming year at Rancho Santa Fe consists of the inclusion of either pyrethrum extract or nicotine sulfate at the rate of 1:1,200 in the regular late summer oil spray for scale insects and the citrus red mite."

Thysanoptera of the Philippine Islands, D. MOULTON (*Philippine Jour. Agr.*, *7 (1936), No. 2, pp. 263–273*).—In this first contribution, devoted to the Terebrantia, 15 species of thrips known in other countries are recorded from the Philippines, and descriptions are given of 10 species new to science whose habitat at the present time is limited to the Islands.

General catalogue of the Hemiptera, II, III, IV, pts. 1 and 2 (*Northampton, Mass.: Smith Col., 1929, fasc. 2, pp. [8]+15; 3, pp. [3]+144; 1932, fasc. 4, pt. 1, pp. [3]+69; 1936, fasc. 4, pt. 2, pp. [3]+269*).—In continuation of this catalog (E. S. R., 58, p. 454), the Mesoveliidae is dealt with by G. Horváth in fascicle 2, the Pyrrhocoridae by R. F. Hussey with a bibliography by E. Sherman in fascicle 3, and the Fulgoroidea (part 1, Tettigometridae, and part 2, Cixiidae) by Z. P. Metcalf in fascicle 4.

Life history of the wheel-bug (Arilus cristatus (Linn.)) (Hemiptera: Reduviidae), J. N. TODD (*Ent. News, 48 (1937), No. 8, pp. 226–228*).—A contribution on the biology of the wheel bug contributed from the South Carolina Experiment Station.

The lantana bug (Teleonemia lantanae Distant), R. V. FYFE (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 3, pp. 181–186*).—An account is given of the progress made with the lantana leaf bug, a tingitid which was introduced into Australia from Fiji at the close of 1935 to assist in the control of *Lantana camara*, a native of tropical America which had become an important weed pest in the coastal region of tropical and subtropical Australia.

"These studies indicate that if *T. lantanae* becomes established and flourishes in this country it may be expected to reduce seriously the vigor of individual lantana plants. This should often give competing plants an advantage which would enable them to displace the lantana. On a heavily infested plant the attack may be severe enough to defoliate it and to kill it directly. As the bugs destroy the flowers and flower buds, they will limit seed production, and, consequently, check the spread of the lantana pest."

Insect hosts and nymphal development of Podisus maculiventris Say and Perillus bioculatus F. (Hemiptera, Pentatomidae), B. J. LANDIS (*Ohio Jour. Sci., 37 (1937), No. 4, pp. 252–259*).—The author found that the rate of develop-

ment and the amount of mortality among sets of nymphs of the spined soldier bug and *P. bioculatus* reared on several insect hosts and under comparable conditions in the insectary appeared to depend upon the kind of food taken. It appears that certain substances transmitted from the plant through the host to the predator caused large numbers of nymphs to die, yet in some cases did not affect the rate of development of those that survived.

Bedbugs, E. A. BACK (*U. S. Dept. Agr. Leaflet 146 (1937), pp. 8, figs. 7*).—A practical account.

Lygus pabulinus L. attacking loganberries and cultivated blackberries, G. L. HEY (*Ent. Mo. Mag., 3. ser., 23 (1937), No. 274, p. 234*).—A report is made of a heavy infestation of *L. pabulinus* and injury to loganberry and blackberry plantations near Wisbech, England.

The biological control of the apple leaf-hopper Typhlocyba froggatti Baker, J. W. EVANS (*Tasmanian Jour. Agr., 8 (1937), No. 4, pp. 171–173, figs. 3*).—The mymarid parasite *Anagrus armatus* Ashm., which attacked both the overwintering eggs of the apple leafhopper *T. froggatti* laid under the bark of young apple shoots and the summer eggs that were laid inside the veins and midribs of leaves in New Zealand to the extent of 80 percent in 1934 (as noted by Dumbleton (E. S. R., 72, p. 362)) and 90 percent in 1936 of the former and 66 percent in January 1935 of the latter, is said to have been introduced about 1927 and to be spreading so rapidly in Tasmania that it will soon be found in every apple orchard in the State. It is known in Tasmania as the canary fly.

Apple leaf-hopper investigations, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 12, pp. 866–877, figs. 8*).—In observations of the Delicious apple in the Annesbrook orchard of the Cawthron Institute during the season 1934–35 a population of approximately 30 nymphs per 100 leaves in the first brood and 60 leaves in the second brood of the apple leafhopper *Typhlocyba froggatti* Baker (=*australis* Frogg.) was present, but this was not sufficiently large to produce serious damage. An attempt was made to establish the dryinid parasite *Aphelopus typhlocybae* Mueseb., an important enemy of the white apple leafhopper in the United States (E. S. R., 74, p. 820; 75, p. 655), which has been proved to complete its development normally in New Zealand on *T. froggatti* (=*australis*). It is thought that the heavy mortality of leafhoppers parasitized under laboratory conditions may be largely due to superparasitism and hosts of unsuitable age.

Bionomics of the plum and peach leafhopper Macropsis trimaculata, A. HARTZELL (*Contrib. Boyce Thompson Inst., 9 (1937), No. 2, pp. 121–136, figs. 4*).—Studies made of the biology of *M. trimaculata* (Fitch), which, as the vector of peach yellows and little peach, causes heavy losses to both peach and plum plantings throughout the area in which these diseases are endemic, are reported.

This leafhopper, reported only from North America, occurs as far west as Colorado and as far south as Virginia, its northern range including southern Ontario and Quebec. *Prunus americana* is the principal wild host, but it also occurs on *P. angustifolia*, *P. munsoniana*, and *P. pissardi*. It occurs sparingly on peach and in greater numbers on *P. domestica* but prefers Japanese and Chinese plums. Until recently the injury to plum has been overlooked, because yellows on plum is masked.

"Under natural conditions there is only one brood of *M. trimaculata* each year. The insect passes the winter in the egg stage in slits beneath the outer bark of plum and to a lesser extent in peach. The eggs hatch during the latter part of May and the early part of June in the latitude of Yonkers, N. Y. The nymphal period requires from 21 to 35 days under field conditions. Nymphs reared at

constant temperatures of 5°, 10°, 15°, 20°, and 25° C. were able to complete their development and become adults only at 20°. The nymphal period, however, was greatly lengthened at this temperature, with a minimum of 38 days and a maximum of 74 days. Adults emerged under natural conditions from the middle of June until the first week in July. They were collected in the field as late as the middle of August.

"Unlike most species of leafhoppers, both adults and nymphs feed on the twigs and are only occasionally observed on the foliage. They run rapidly over the twigs, and the adults do not fly when approached, nor do the nymphs hop as is the usual habit of leafhoppers, but seek concealment in the forks of the limbs or on the opposite side of the branch from the observer.

"The population distribution is also erratic, depending upon host preference, rainfall at the time the eggs hatch, and on other ecological factors.

"Aside from a species of spider that was found feeding on a nymph, no predaceous or parasitic enemies of *M. trimaculata* were observed."

A list is given of 36 references to the literature.

Leafhopper control, C. S. Beckwith (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 67 (1936), pp. 22–24*).—The progress of control work with the blunt-nosed leafhopper *Euscelis striatulus* Fall. on cranberry bogs, conducted by the New Jersey Cranberry Substation, is briefly reported.

Control of the blunt-nosed leafhopper, C. S. Beckwith (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 68 (1937), pp. 9–14*).—In further work at the New Jersey Cranberry Substation it is pointed out that the most effective method of control may vary with the surrounding conditions. The value of a survey before and after application of control measures, effected through leafhopper collections with an insect net, is emphasized. Airplane application of pyrethrum dust is more generally employed due to the ease of application.

Biological testing of pyrethrum dusts with the blunt-nosed leafhopper, C. A. Doehlert (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 67 (1936), pp. 17–22*).—The results of tests conducted at the New Jersey Cranberry Substation (E. S. R., 74, p. 666) are reported, the details being given in five tables. It is pointed out that established methods of testing the quality of pyrethrum insecticides are relatively new and consist mainly in laboratory tests with the insect concerned and in chemical analyses for total pyrethrins or pyrethrins I and II. No previous biological method for laboratory use has been worked out for the blunt-nosed leafhopper *Euscelis striatulus* Fall., and the author had only chemical analyses to use for a basis of judgment in addition to field tests. The practical use of the chemical analyses is quite new and is complicated by the fact that the comparative values of pyrethrins I and II are not definitely established, especially in respect to the blunt-nosed leafhopper. A laboratory method is herein described by which the blunt-nosed leafhopper may be used as an indicator of the relative potency of pyrethrum insecticides for use against this leafhopper. It is proposed as a supplement to chemical analyses and field tests.

[Notes on dusting for the blunt-nosed leafhopper Euscelis striatulus Fall.], C. A. Doehlert (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 68 (1937), pp. 24–27*).—Reporting briefly on the progress of control work with *E. striatulus* at the New Jersey Cranberry Substation, new materials for dusting and dusting on wet vines are considered. The results of the experiment conducted and a large-scale practical test at Whitesbog make it quite evident that the presence of the morning dew does not interfere with the efficiency of pyrethrum dusting in the control of this pest. The leafhopper kill (about 98 percent) obtained from the application of impregnated and of activated dusts was found to be nearly the same as that from pyrethrum flowers. It is pointed

out that since the amount of impregnated dust used (2 percent pyrethrins) was only one-sixth the weight of the flowers and the pyrethrins content of the activated dust about two-thirds that of the flowers there appears to be an opportunity for considerable saving.

The emergence of the cicada, W. W. Coblentz (*Sci. Mo., 43 (1936), No. 3, pp. 239–243, figs. 19*).—A description of the emergence of the cicada, illustrated by a series of photographic reproductions.

The green muscardine fungus on the periodical cicada, S. K. Katsura and A. G. Johnson (*Science, 86 (1937), No. 2223, p. 128*).—The finding of the green muscardine fungus (*Metarrhizium anisopliae*) on the periodical cicada in Maryland in May 1936 is reported, followed by notes on observations and references to the literature.

Healthy nymphs and healthy adults were artificially inoculated with spores from the pure cultures of *M. anisopliae* kept in moist Erlenmeyer flasks, and both nymphs and adults became diseased, the nymphs being more susceptible than the adults. The fungus was readily reisolated but did not sporulate on the adults. Later, newly hatched nymphs also were inoculated in Petri dishes and these young nymphs proved to be unusually susceptible.

The species described as *M. cicadinum* (*Penicillium cicadinum* v. Höhnel 1909) is considered the short-spored form of *M. anisopliae* found in Java on large singing cicadas.

The biological control of the greenhouse white fly in Australia, A. L. Tonnoir (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 2, pp. 89–95, pls. 3*).—This contribution relates particularly to the chalcid wasp parasite *Encarsia formosa* and the history of its introduction into and establishment in Australia for control of the greenhouse white fly.

Bramble fruit aphids, G. F. Knowlton and M. W. Allen (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 309–316, figs. 58*).—Descriptions and collection notes based upon observations throughout the northwestern United States of aphids infesting raspberries and other bramble fruits are contributed from the Utah Experiment Station. Of the 11 forms noted, 2 species are described as new and a third as a new subspecies, namely, *Amphorophora arnicae thatcheri*, collected on loganberry at Potter Creek, Idaho; *A. bonnevilla*, collected upon red raspberry leaf at Farmington, Utah; and *A. rubicumberlandi*, taken on the canes of wild and cultivated black raspberries (Cumberland) at the Western Washington Experiment Station, Puyallup, Wash., and on *Rubus leucodermis* at Yelm, Wash.

Avocado fumigation investigations, H. L. McKenzie and D. L. Lindgren (*Calif. Dept. Agr. Bul., 26 (1937), No. 3, pp. 311–319, figs. 4*).—The results of monthly field fumigation tests with avocado for control of the latania scale *Aspidiotus lataniae* Sign., the most important insect pest of the avocado in California, are reported in this contribution from the California Citrus Experiment Station.

A monograph of the pierine genus Delias, I–V, G. Talbot (*London: John Bale, Sons & Danielson, 1928, pt. 1, pp. 56, fig. 1; 1929, pts. 2, pp. 57–115, pls. 7; 3, pp. 117–167, pls. 4; 4, pp. 168–219, pls. 6; 1930, pt. 5, pp. 220–259, pls. 6*).—A monographic account of the pierine genus *Delias*, of which 157 species and many forms are recognized.

A monograph of the pierine genus Delias, VI, G. Talbot (*London: Brit. Mus. (Nat. Hist.), 1937, pt. 6, pp. V+261–656, pls. 48*).—The concluding part of the work noted above.

California microlepidoptera, XII, H. H. Keifer (*Calif. Dept. Agr. Bul., 26 (1937), No. 3, pp. 334–338, figs. 30*).—This further contribution (E. S. R., 78, p. 223) gives descriptions and illustrations of two new species of Lepidoptera.

Life-histories of Indian microlepidoptera (second series): Cosmopterygidae to Neopseustidae, T. B. FLETCHER (*Imp. Council Agr. Res. [India], Sci. Monog. 4 (1933), pp. 85, pls. 77*).—This monograph, together with No. 2 previously noted (E. S. R., 69, p. 392), brings together information acquired during the last 12 yr. and adds further information on many species previously recorded as well as on 250 additional species, so that some knowledge is now available on life histories of about 650 species of Indian microlepidoptera, or roughly 20 percent of those described.

The parasites of the fall webworm (Hyphantria cunea Drury) (Lep.: Arctiidae), R. B. SWAIN (*Ent. News, 48 (1937), No. 9, pp. 244–248*).—This is considered to be a complete list of the dipterous and hymenopterous insects known to be parasites of the fall webworm. It is accompanied by a list of 21 references to the literature.

The importance of mulberries in raisin moth control, H. C. DONOHOE, P. SIMMONS, D. F. BARNES, and C. K. FISHER (*Calif. Dept. Agr. Bul., 26 (1937), No. 3, pp. 339, 340*).—Attention is called to the importance as a means of control of the raisin moth of the elimination of waste fruits (particularly mulberries) that have fallen and lie in the shade between trees and vines.

Report on leaf-roller in central Otago, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 12, pp. 877–887, figs. 2*).—A report is made of a study of the biology of the native tortricid moth *Tortrix excessana* Walk., an enemy of stone fruit in central Otago, and means for its control. Notes on the associated species *T. postvittana* Walk., *Harmologa oblongana* Walk., and *Ctenopseustis obliquana* Walk. also present in smaller numbers, and on the codling moth are included.

Codling moth control by non-arsenical sprays, H. JARVIS (*Queensland Agr. Jour., 43 (1935), No. 1, pp. 5–8*).—A report of work in continuation of that previously noted (E. S. R., 69, p. 831).

Codling moth control experiments, 1936–37, H. JARVIS (*Queensland Agr. Jour., 48 (1937), No. 3, pp. 252–257*).—In continuation of control work with the codling moth above noted, "five nonarsenical sprays, bentonite sulfur-nicotine sulfate, colloidal sulfur-nicotine sulfate, nicotine sulfate-white oil, potash soft soap, and colloidal sulfur-potash soft soap, gave very promising results. Potash soft soap alone compares favorably with lead arsenate so far as price is concerned, and, as colloidal sulfur can conveniently be added when necessary for the control of powdery mildew and red mite, more exhaustive studies of this insecticide will be carried out in the coming season."

The pea moth Laspeyresia nigricana Steph., on the Gaspe coast, A. D. BAKER (*Sci. Agr., 17 (1937), No. 11, pp. 694–702, figs. 4; Fr. abs., p. 702*).—The pea moth is said to have caused very severe injury to green peas on the Gaspé coast of Quebec, particularly in Bonaventure County. The areas of infestation have been found to extend along all the cultivated shore regions of that county and to be directly linked with infestations in New Brunswick on the southern side of the bay of Chaleur.

Bionomic notes on the common bagworm (Thyridopteryx ephemeraeformis Haw.) (Lepid., Psychidae) and its insect enemies (Hym., Lepid.), W. V. BALDUF (*Ent. Soc. Wash., Proc., 39 (1937), No. 7, pp. 169–184, figs. 3*).—Notes on the biology of the bagworm and its insect enemies, based upon observations in 1932 and 1936 in and about Urbana-Champaign, Ill., include data on the scavenger and predator *Dicymolomia julianalis* Walk. and the parasites *Itoplectis (Pimpla) conquisitor* (Say), *Epiurus indagator* (Cress.), and *Hemiteles (Allocota) thyridopterigis* Riley. A list of 49 references to the literature cited is included.

Two closely related species of Heliothis found in tomato fields of central California, W. H. LANGE and A. E. MICHELBACHER (*Calif. Dept. Agr. Bul.*, *26* (*1937*), *No. 3, pp. 320–325, figs. 9*).—A description is given of the stages of the corn earworm and *H. phloxiphaga* Grote and Rob., two species which often appear similar but differ considerably in their habits. Both species may be abundant in tomato fields, but only the corn earworm is capable of serious injury, *H. phloxiphaga* being unable to complete its life cycle on either the vine or fruit.

[**Lima beans attacked by the corn earworm**], S. MARCOVITCH (*Assoc. South. Agr. Workers Proc.*, *37–38* (*1936–37*), *p. 277*).—Reporting from the Tennessee Experiment Station, several hundred acres of lima beans grown for canneries in Monroe County are said to have been almost completely destroyed in September by the corn earworm, due largely to the absence of the silk stage of corn, their preferred host plant. As a result of the hot, dry summer, there was such an increase in the number of worms that when they suddenly appeared they devoured the pods too rapidly for effective application of sprays by the limited spraying machinery available. To meet the emergency, several baits were broadcast over the fields, the best results having been obtained from cottonseed meal with 5 percent of sodium fluosilicate applied at the rate of 100 lb. to the acre. The cost of this treatment is low, since the cottonseed meal residue acts as a fertilizer, and it has the advantage that large acreages can be covered rapidly if the occasion demands it. It is pointed out that except in an emergency dependency should be placed upon corn as a trap crop planted in adjacent fields to silk about the time the beans commence to bloom.

***A probable cultural control for the pale western cutworm* (Agrotis orthogonia Morr.)**, H. L. SEAMANS (*Sci. Agr.*, *17* (*1937*), *No. 10, pp. 612–615; Fr. abs., p. 614*).—Observations have led to the discovery that, while newly hatched larvae of the pale western cutworm can withstand long periods of starvation when kept cool, if fed they later succumb within a few days when food is not available. Experiments on a field scale in 1936 demonstrated that a delay of five or more days between cultivation and seeding in infested fields virtually eliminated both injury and the cutworms themselves in plats or mile-square fields.

Cutworms as sugar-beet pests, and their control, F. R. PETHERBRIDGE and J. H. STAPLEY (*Jour. Min. Agr.* [*Gt. Brit.*], *44* (*1937*), *No. 1, pp. 43–49, pls. 2*).—Observations are said to have shown that cutworms of the turnip moth *Euxoa segetum* Schiff. feed on sugar beet plants from the end of June until harvest time and are capable of causing severe injury to late-sown crops. Cutworms of the garden dart moth *E. nigricans* L., hitherto unrecorded as a beet pest, caused severe damage to young seedlings in the fens in May and June of 1935 and 1936.

Noctuidae taken at a bait trap in Kansas, H. H. WALKDEN (*Ann. Ent. Soc. Amer.*, *30* (*1937*), *No. 2, pp. 296–303*).—Observations extending from 1921 to 1931, inclusive, at Wichita, Kans., are reported, the details being given in tables.

Contribution to the study of diseases of insects caused by filtrable virus, II [trans. title], A. PAILLOT (*Ann. Épiphyt. et Phytogénét.*, *n. ser.*, *2* (*1936*), *No. 3, pp. 341–379, figs. 36*).—This further contribution (E. S. R., 56, p. 554) deals with two types of pseudograsserie of the cutworm *Euxoa segetum*, polyhedral disease of caterpillars of *Vanessa urticae* L. and of *E. segetum*, and some mixed diseases. A list is given of 20 references to the literature.

The mosquitoes of Minnesota, with special reference to their biologies, W. B. OWEN (*Minnesota Sta. Tech. Bul. 126* (*1937*), *pp. 75, figs. 12*).—Following a brief introduction in which reference is made to the economic importance of, disease transmission by, and methods of study of mosquitoes, the ecological

relationships, including topography and climate of Minnesota, vegetational regions, and larval habitats and associations, are considered and the biology and taxonomy of the species occurring in the State (7 genera and 37 species) dealt with. Keys for the identification of mosquitoes of the State, including a simple recognition key and keys to the species of *Anopheles, Aedes, Culex*, and *Theobaldia* (both adults and larvae), and tables showing the occurrence of larvae by species and type of habitat and occurrence of larval association are included, together with maps illustrating their distribution. A list of 41 references to the literature is included.

Principles underlying the protection of outdoor meetings from the mosquito pest and methods of application, J. M. Ginsburg (*N. J. Mosquito Extermin. Assoc. Proc., 24 (1937), pp. 5–11*).—Experiments with the New Jersey Pyrethrum Mosquito Larvicide in protecting all kinds of outdoor evening gatherings from mosquito bites, conducted by the New Jersey Experiment Stations during three seasons, of which the earlier work has been noted (E. S. R., 74, p. 522), are described.

Different types of sprayers were tested with the larvicide containing kerosene extract of pyrethrum and a suitable emulsifier. The results thus far obtained indicate that (1) outdoor areas, such as picnic grounds, stadiums, lawns, and porches, can be made practically mosquito-free without injury to vegetation and with no appreciable discomfort to people; (2) on large areas power sprayers capable of quickly supplying a fine fog, high in the air, are required; (3) on small areas, such as lawns and porches, hand pump sprayers or small electric sprayers may be employed; and (4) on small porches centrifugal electric vaporizers can be used provided that the operation is continuous and produces a constant supply of larvicide mist.

Notes on the continuous rearing of Aëdes aegypti in the laboratory, H. A. Johnson (*Pub. Health Rpts. [U. S.], 52 (1937), No. 35, pp. 1177–1179*).—A report is made of experiments covering a period of two winter seasons which demonstrate quite clearly the advantages of the procedure described for the continuous rearing of groups of yellow-fever mosquitoes in the laboratory.

The chrysanthemum midge (*Jour. Min. Agr. [Gt. Brit.], 43 (1937), No. 12, pp. 1158–1161, pls. 2*).—A brief account of this midge (*Diarthronomyia* sp.), which has been found attacking greenhouse chrysanthemums twice in England and once in Denmark.

Zodion fulvifrons Say (Diptera: Conopidae), a parasite of the honey bee, H. C. Severin (*Ent. News, 48 (1937), No. 9, pp. 243, 244*).—A dipterous parasite of the family Conopidae which caused rather heavy loss of young worker bees in a hive of an apiary at Sisseton, S. Dak., is reported upon. An examination of the bees indicated that fully 50 percent of the worker bees were infested with fly larvae, which were always located in the abdomen.

A note on two larval parasites of the sugar-cane moth-borer in São Paulo, Brazil, S. C. Harland (*Trop. Agr. [Trinidad], 14 (1937), No. 10, p. 280*).—Record is made of the rearing from material collected in the State of São Paulo of two species of sugarcane moth borer (*Diatraea* spp.) parasites, namely, the Amazon fly *Metagonistylum minense* Towns., which was present in great abundance, approximately 56 percent of the larvae being attacked, and *Paratheresia brasiliensis* Towns.

A field experiment on the control of the European corn borer (Pyrausta nubilalis Hubn.) by Beauveria bassiana Vuill, G. M. Stirrett, G. Beal, and M. Timonin (*Sci. Agr., 17 (1937), No. 9, pp. 587–591*).—The work here reported indicates that by dissemination of the spores of *B. bassiana* to infested corn plants a marked reduction in the population of the European corn borer may be effected. There is said to be an indication that the time of application

is of the greatest importance and worthy of further investigation. The fact that some disease was found in the control plats in the second examination suggests that the buffers about the plats were inadequate.

Timely suggestions for sugarcane borer control, B. A. Osterberger (*Sugar Bul., 16 (1937), No. 4, pp. 2, 3*).—It is pointed out in this practical contribution from the Louisiana Experiment Station that in all cases over a period of several years in which cane trash was burned very carefully only 17 percent of the borer stages survived, as compared with 52 percent found alive the following spring when the trash was not burned. This indicated that there are three times as many borers alive in trash that is not burned.

New fly parasites of Dysdercus, C. H. T. Townsend (*Rev. Ent., 7 (1937), No. 2–3, pp. 316–318*).—Descriptions are given of four new dipterous species reared from cotton stainers by L. O. T. Mendes at the Institute of Agronomy, Campinas, Brazil, under the names *Acaulona brasiliana, Euomogenia dysderci, Paraphorantha brasiliana,* and *P. dimidiata.* These species, if properly handled, are considered to be capable of controlling cotton stainers in São Paulo.

Notes on dipterous parasites of spiders, B. J. Kaston (*Jour. N. Y. Ent. Soc., 45 (1937), No. 3–4, pp. 415–420, figs. 5*).—Contributing from the Connecticut [New Haven] Experiment Station, an account is given of the dipterous parasites *Ogcodes costatus* Loew and *O. pallidipennis* Loew, the host spider of the former being a species of *Lycosa* and of the latter *Sceliphron caementarius.* A list of 22 references to the literature is included.

The bionomics of Chaetophleps setosa Coquillett (Diptera: Tachinidae), J. E. Bussart (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 285–295, figs. 16*).—A study made of the tachinid *C. setosa,* a well-known internal parasite of the striped cucumber beetle which appears to be widely spread over most of the northern States, with records showing that it occurs in several States from Maine to Oregon, is reported upon.

The life history of Gaurax araneae Coq. (Diptera-Chloropidae), an egg predator of the black widow spider (Latrodectus mactans (Fabr.)), E. L. and B. B. Kessel (*Pan-Pacific Ent., 13 (1937), No. 1–2, pp. 58–60*).—Observations of the dipterous predator *G. araneae* of the eggs of the black widow spider, a common species in the San Francisco Bay region and at Mill Valley, where 40 percent of an extensive series of egg sacs collected by the authors were found infested, are reported upon.

A statistical analysis of fly mortality data, C. A. Murray (*Soap, 13 (1937), No. 8, pp. 89–99, 101, 103, 105*).—This analysis deals particularly with the different factors causing discrepancies in fly mortality data.

Semi-concentrate fly sprays, W. N. Sullivan (*Soap, 13 (1937), No. 9, pp. 88, 89, 91, figs. 4*).—The progress of a study made by the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with the National Association of Insecticide and Disinfectant Manufacturers with a view to determining the best methods of testing household insecticides and developing standard methods for such testing is reported upon, the details being given in tables and graphs.

"An increase in concentration of pyrethrins in semiconcentrate fly sprays of pyrethrum at first brought about a corresponding increase in toxicity to houseflies, but at higher concentrations the mortality curve leveled off. When samples of pyrethrum of different pyrethrin concentration were diluted to the same concentration, the mortality of the flies was nearly the same in all cases. Semiconcentrate fly sprays containing paired combinations of rotenone, an aliphatic thiocyanate, and pyrethrins, when undiluted gave almost equally high mortalities in 3 days, but when diluted with 2 parts of kerosene there was a wide range in kill. A comparison of the mortalities at the end of 1, 2, and 3

days showed the desirability of a 3-day observation period when the spray contains rotenone. It seems, therefore, that the best method for the biological testing of semiconcentrate fly sprays is to dilute them and compare them with a standard."

The tsetse flies of east Africa: A first study of their ecology, with a view to their control, C. F. M. Swynnerton (*Roy. Ent. Soc. London, Trans., 84 (1936), pp. XXXVI+579, pls. [30], figs. 33*).—Part 2 (pp. 28–240) of this work on the tsetse flies of east Africa reports upon observations of the habits and ecology of tsetse flies with a view to devising means for their destruction.

Studies on the higher Diptera of medical and veterinary importance, W. S. Patton (*Ann. Trop. Med. and Parasitol., 31 (1937), No. 3, pp. 341–359, figs. 14*).—In these two papers (E. S. R., 77, p. 666) illustrations are given of the terminalia of *Cobboldia elephantis* Steel, *C. chrysidiformis* Rodhain and Bequaert, and *Rutteuia loxodontis* Rodhain (pp. 341–349) and of some species of *Gastrophilus* (pp. 351–359).

Studies on the higher Diptera of medical and veterinary importance.—A revision of the species of the genus Glossina Wiedemann based on a comparative study of the male and female terminalia, W. S. Patton (*Ann. Trop. Med. and Parasitol., 30 (1936), Nos. 2, pp. 151–168, figs. 23; 3, pp. 305–330, figs. 25*).—A conclusion of the contribution previously noted (E. S. R., 76, p. 77).

The present position in blowfly control in New South Wales, with special reference to the problems associated with jetting, R. N. McCulloch (*Jour. Austral. Inst. Agr. Sci., 3 (1937), No. 3, pp. 129–137, figs. 3*).—A summary is given on the control of blowfly attack of sheep in New South Wales through reducing the fly population and protecting sheep from infestation and the form which future research on jetting should take, based upon 6 years' work dealing with the protection of sheep in this way. A combination of crutching and jetting is considered to offer not only the cheapest protection against strike, but cheap control of the blowfly pest in the absence of all other methods.

Notes on the autecology of some fruit-flies, III, IV, K. Shibata (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 8 (1936), Nos. 1, pp. 95–101, fig. 1; 4, pp. 373–380, fig. 1*).—Part 3 of this contribution (E. S. R., 76, p. 833) considers the velocity and threshold of development of eggs of *Chaetodacus ferrugineus dorsalis* Hendel and part 4 the velocity and threshold of development of eggs of *C. cucurbitae* Coq.

Experimental studies on the influence of low temperatures upon the development of fruit-flies, VII–IX, K. Koidsumi (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaisi), 8 (1936), No. 3, pp. 221–236; 9 (1937), Nos. 1, pp. 54–59; 2, pp. 236–246*).—Part 7 of this contribution (E. S. R., 74, p. 375) reports on the fatal action of low temperatures upon the eggs and larvae of *Chaetodacus ferrugineus dorsalis* Hendel (pp. 221–236), part 8 on the fatal action of low temperatures upon the pupae of *C. ferrugineus dorsalis* (pp. 54–59), and part 9 on the acclimation to low temperatures in the melonfly pupae (pp. 236–246).

The asparagus fly, A. S. Buckhurst (*Jour. Min. Agr. [Gt. Brit.], 43 (1937), No. 10, pp. 941–943, pls. 2*).—An account of *Platyparea poeciloptera* Schr., a native of central and south Europe which was first reported from the Netherlands in 1931 and appeared at Hertford, England, in 1935.

The asparagus fly Platyparea poeciloptera Schr. (Dipt., Trypetidae) in England, A. S. Buckhurst (*Ent. Mo. Mag., 3. ser., 23 (1937), No. 272, pp. 187–190, figs. 2*).—The asparagus fly *P. poeciloptera*, a serious pest of asparagus on the continent of Europe but not previously recorded from Great Britain, was found in 1936 to be widely distributed in the southern half of Hertfordshire.

The ragwort leaf-miner Phytomyza atricornis Mg. and its parasite Dacnusa areolaris Nees., J. M. KELSEY (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 10, pp. 762–767*).—Observations of the life history of *P. atricornis*, its influence on the ragwort host plant, and the influence of the parasite *D. areolaris* on the leaf miner, based upon experiments conducted, are reported.

The melon fly (Dacus cucurbitae Coquillet), A. PONCE (*Philippine Jour. Agr., 8 (1937), No. 3, pp. 289–309, pls. 4, figs. 2*).—The study of the life history and habits of the melonfly, one of the most important insect enemies of cucurbits in the Philippines, here reported upon, includes a brief discussion of control measures.

Some morphological differences between the screwworm fly (Cochliomyia americana C. & P.) and other closely allied or similar species in North America (Diptera: Calliphoridae), E. C. CUSHING and D. G. HALL (*Ent. Soc. Wash., Proc., 39 (1937), No. 7, pp. 195–200, figs. 17*).—This contribution, in which characters by which species of *Cochliomyia* and of certain related genera may be differentiated by workers engaged in an economic study of flies causing wound myiasis in man and animals, includes a key to facilitate such identification.

Sulphur dips for the control of goat lice, O. G. BABCOCK (*Southwest. Sheep and Goat Raiser, 7 (1937), No. 17, pp. 5, 28*).—Experiments were conducted by the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with the Texas Experiment Station at the Sonora Substation in an attempt to develop a safe and efficient dip without the objectionable features of the old dips. Finely ground sulfur, 98 to 100 percent passing through a 325-mesh screen, gave excellent results and was recommended for goat lice control. Flotation sulfur prepared by the liquid purification process, when further purified of traces of iron and arsenic sulfide left by its manufacture, gave equally good results and is likewise recommended. The formula recommended for effective control, using either of these sulfurs, is sulfur 10 lb., trisodium phosphate 10 to 25 oz., depending upon the hardness of the water used, and water 100 gal. Two dippings with 11-day intervals are recommended.

All the five species of goat lice known to occur in the United States have been collected from milk goats, *Linognathus stenopsis* (Burm.), *L. africanus* Kellogg and Paine, *Bovicola penicellata* Piaget (known as the hairy goat louse), and *B. caprae* Gurlt and *B. limbatus* Gervais (known as red goat lice).

An investigation into the relation between chafer larvae and the physical factors of their soil habitat, J. HAVELOCK FIDLER (*Jour. Anim. Ecol., 5 (1936), No. 2, pp. 333–347, figs. 3*).—The investigation here reported upon was undertaken with a view to discovering some relationship between factors making up the microclimate of the soil and the behavior of the larvae of chafer beetles which inhabit it. The oval, larval, and pupal stages of these insects, comprising 98 percent of their total life history, are all spent in this environment.

The embryology of Calendra callosa Olivier, the southern corn billbug (Coleoptera, Rhynchophoridae), D. L. WRAY (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 361–409, figs. 115*).—This illustrated account of the embryology of *C. callosa* is accompanied by a bibliography of 36 titles.

Structure of the reproductive system of the pecan weevil (Curculionidae), T. L. BISSELL (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 242–251, figs. 8*).—A study of the reproductive system of both male and female of the pecan weevil, which is noted for its extremely long and slender beak used for drilling the coverings of the host fruit for feeding and in preparation for egg laying, is reported upon by the Georgia Experiment Station and the U. S. D. A. Bureau of Entomology and Plant Quarantine cooperatively.

The influence of a pure carbohydrate diet on newly emerged honeybees, M. H. HAYDAK (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 258–262*).—In a study conducted at the Minnesota Experiment Station it was found that newly emerged honeybees could subsist on a pure carbohydrate diet for a relatively long time. The dry weight and nitrogen content of their bodies diminished, the greatest percentage of loss of nitrogen being in the heads and abdomens and the lowest in the thoraxes. The amount of nitrogen lost by each of these parts of the bee body was about the same. The mortality of the bees was high. When pollen was added to the diet of such bees they developed their bodies and commenced brood rearing normally. The resulting bees were normal.

Populations and territories of the ants* Formica fusca, Acanthomyops flavus, *and* Myrmica ruginodis *at Thornhill (Yorks), W. PICKLES (*Jour. Anim. Ecol., 5 (1936), No. 2, pp. 262–270, pl. 1, fig. 1*).—A survey, undertaken as a further contribution (E. S. R., 74, p. 75) to the records of ant territory, and also to determine by actual counts the populations (including the immature forms) of the ants' nests, made at Thornhill, Yorkshire, is reported upon.

New species of* Andrena *from California (Hymenoptera), P. H. TIMBERLAKE (*Pan-Pacific Ent., 13 (1937), No. 1–2, pp. 69–74*).—Four black species of solitary bees of the genus *Andrena* are described as new in this contribution from the California Citrus Experiment Station.

The influence of the instars of host larvae on the sex of the progeny of* Tiphia popilliavora *Roh., M. H. BRUNSON (*Science, 86 (1937), No. 2226, p. 197*).—In the course of studies recently completed on the interrelation of the larval instars of the Japanese beetle and its parasite *T. popilliavora*, it was definitely proved that the female parasite has the ability to vary the sex of her progeny at the time of parasitization of the host larvae of different instars. The stimulus to which the female responds in controlling the sex of her progeny is definitely associated with the instar or size of host on which the eggs are placed. The resultant parasite progeny were still predominantly males when parasite eggs were transferred from second-instar host larvae to the larger third-instar host larvae, while a normal ratio of males and females resulted when parasite eggs were transferred from third-instar host larvae to the smaller second-instar host larvae.

Control of tobacco blue mold (downy mildew) and tobacco flea beetle (a progress report in two parts).—II, Suggestions for control of tobacco flea beetle, W. J. SCHOENE and G. W. UNDERHILL (*Virginia Sta. Bul. 313 (1937), pp. 11–14, figs. 2*).—Part 1 of this bulletin has been noted on page 801.

A practical account is given of control measures for the tobacco flea beetle. In an outbreak in 1937 in Virginia, especially in Pittsylvania County, and in the Piedmont section of North Carolina, there was a severe feeding on the foliage, with the upper parts of some plants almost completely consumed.

***Notes on the life history and anatomy of* Trichogramma**, S. E. FLANDERS (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 304–308, figs. 6*).—A study of the development and morphology of *T. evanescens* and *T. embryophagum* when reared in the eggs of the salt-marsh caterpillar, conducted at the California Citrus Experiment Station, is reported upon.

"The incubation of the egg required nearly as many hours as the feeding period of the larva. There were three larval instars, each distinguished by the size of the mandibles and the form of the body. The prepupal stage of *T. embryophagum* appeared to be shorter than that of *T. evanescens* when developing under the same conditions. This difference accounts for the variation in their life cycles."

Collecting red and black scale parasites in Africa, H. COMPERE (*Calif. Citrogr., 23 (1937), No. 2, pp. 58, 88, 89, figs. 3*).—A report is made on the col-

lection of parasites of the black scale and the California red scale in south and east Africa during a period of 10 mo., and the successful propagation of 10 of the former and 1 of the latter by the California Citrus Experiment Station.

Liberation of black scale parasites during year 1937, S. E. Flanders (*Calif. Citrogr., 23 (1937), No. 2, p. 59, fig. 1*).—A report from the California Citrus Experiment Station on the rearing and liberation of the black scale parasites introduced from Africa by Compere, above noted. The liberations made by the cooperating insectaries have consisted largely of species of *Metaphycus*, *Euaphycus*, and *Encyrtus*.

Habitat selection by Trichogramma, S. E. Flanders (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 208–210*).—Observations by the California Citrus Experiment Station of the three common species of *Trichogramma* in North America, namely, *T. evanescens* Westw., *T. embryophagum* (Htg.), and *T. semblidis* (Aur.), which successfully parasitize fertile, infertile, or dead eggs of many species of insects, are reported. Under artificial conditions they are reared readily on many common hosts, yet under natural conditions they are rarely found associated. The available host records indicate that *T. evanescens* prefers field habitats, *T. embryophagum* arboreal habitats, and *T. semblidis* marsh habitats. It appears that within a favorable habitat the type of plant surface affects the amount of parasitism. It is pointed out that the differences in the crawling and flying habitats of these species may be accounted for as habitat adaptations.

Researches on the biology of hymenopterous parasites: The Trichogrammas [trans. title], P. Marchal (*Ann. Épiphyt. et Phytogénét., n. ser., 2 (1936), No. 4, pp. 447–550, pl. 1, figs. 23*).—Following an introduction in which the biotypes of *Trichogramma* are considered and historical information presented, the author deals with studies of *T. cacaeciae* (pp. 451–488), *T. flavum* (pp. 488–495), *T. evanescens* (pp. 495–519), crosses of two biotypes (*T. cacaeciae* and *T. evanescens*) (pp. 519–522), observations of the natural forms of *Trichogramma* from the codling moth, European corn borer, and grape berry moths, etc. A bibliography of four pages and a colored plate of *T. cacaeciae* and *T. evanescens* females are included.

Variation in populations and in size of adults of Trichogramma minutum Riley emerging from eggs of Heliothis obsoleta Fab., G. W. Barber (*Ann. Ent. Soc. Amer., 30 (1937), No. 2, pp. 263–268, fig. 1*).—Observations of collections of eggs of the corn earworm made at Richmond, Va., and at Savannah and Sandersville, Ga., are reported. The population of parasites per host egg ranged from one to five, there being approximately twice as many females as males recovered. "The adult parasites were quite variable in wing length. Considered from the viewpoint of relative bulk, the smallest male was about one twenty-fifth the bulk of the largest male, whereas the smallest female was about one-fortieth the bulk of the largest female. While duplication of wing length frequently occurred in the cases where eggs contained more than a single parasite, it was found that more often the parasites emerging from one host egg were of different wing lengths. In each locality and in each sex, the mean wing length of parasites regularly decreased as the population per host egg increased. It thus appears that a determining cause of variation in size of adults of *T. minutum* within a single host egg is the competition for food among the parasite larvae."

A new eriophyid mite from lemon trees (Acarina: Eriophyidae), H. E. Ewing (*Ent. Soc. Wash., Proc., 39 (1937), No. 7, pp. 193, 194, figs. 4*).—Under the name ***Eriophyes sheldoni*** the author describes a new mite that works in the buds of the lemon tree, causing a deformation of the ends of the twigs, in Ventura County, Calif.

The red legged earth mite, D. C. Swan (*Jour. Dept. Agr. So. Austral., 40 (1937), No. 12, pp. 946–948, figs. 2*).—This is a further contribution (E. S. R., 72, p. 670) on *Halotydeus destructor* Tucker, which has in recent years become increasingly common in certain of the wetter parts of South Australia and may in some places be one of the most troublesome winter pests of garden plants and of some field crops, such as peas.

New species of mites of the subfamily Trombiculinae, with a key to the New World larvae of the akamushi group of the genus Trombicula, H. E. Ewing (*Biol. Soc. Wash., Proc., 50 (1937), pp. 167–173*).—A contribution on the chigger mites of the New World, with descriptions of seven new species.

Experimental study of Plasmodium gallinaceum, a parasite of the domestic fowl [trans. title], E. Brumpt (*Ann. Parasitol. Humaine et Compar., 14 (1936), No. 6, pp. 597–620, figs. 10*).—In the course of transmission studies with a strain of *P. gallinaceum* originating in Ceylon (E. S. R., 73, p. 394), the details of which are given in a table of nine pages, it was found to develop rapidly in all of the yellow-fever mosquitoes infected and equally so in *Stegomyia albopicta* (= *S. variegata*). *Culex fatigans* did not transmit the infection even when fed in large numbers on diseased fowl, nor did the northern house mosquito.

Fleas, ticks, and lice retain plague infection after 10 months in icebox (*Pub. Health Rpts. [U. S.], 52 (1937), No. 35, p. 1179*).—Record is made of the finding by W. M. Dickie of typical plague infection in fleas, ticks, and lice taken from ground squirrels in San Mateo County, Calif., after storage from September 1936 to July 1937 in the ice box.

Plague infection in fleas in California, Nevada, and Utah (*Pub. Health Rpt. [U. S.], 52 (1937), No. 35, pp. 1184, 1185*).—Record is made of the finding by W. M. Dickie of plague infection in fleas taken from rodents in San Bernardino County, Calif., Ormsby and Douglas Counties, Nev., and Morgan County, Utah.

ANIMAL PRODUCTION

[Livestock investigations in Alabama, 1934–35 and 1936] (*Alabama Sta. Rpts. 1934–35, pp. 17–20, fig. 1; 1936, pp. 14, 15, 16–18, 23, 24, fig. 1*).—Results are noted for 1934–35 on the use of ice in curing meat on the farm, by J. C. Grimes and W. E. Sewell; and the value of kudzu as a grazing crop for beef cows and poultry, by Grimes, G. J. Cottier, and D. F. King. In 1936 studies with beef cattle and swine yielded information on the cost of beef production, and the value of kudzu as a grazing crop, both by Grimes; the use of ice in the curing of meat on the farm, by Sewell; and lameness in hogs resulting from the grazing of Austrian peas, by W. D. Salmon and Sewell.

Poultry investigations reported include the detection of infertile eggs previous to incubation, and returns from the farm flock, both by King; the supplemental value of peanuts in chick and laying rations, and the value of kudzu and other green feeds for poultry, both by Cottier and King.

Rat feeding trials gave information on the nutritive value of commercial canned dog foods, by C. J. Koehn.

[Experiments with livestock in Oregon] (*Oregon Sta. Bul. 350 (1937), pp. 19, 21, 22, 24, 25, 33, 34, 56, 57, 69–71, figs. 3*).—Included are reports of investigations on fattening cattle on mill run in the Willamette Valley and at the Eastern Oregon Substation; the marketing of country-dressed meats; fattening lambs, both in western and eastern Oregon; wintering range sheep; the productive value of large-type v. small-type ewes, and smooth- v. wrinkled-type Rambouillet ewes; the value of irrigated pasture for sheep; Willamette Valley corn v. Midwest corn for fattening pigs; the relation of various cereals in the

ration to quality of pork; biochemical factors influencing the feeding value of forage crops; the role of iodine in animal nutrition; and the influence of sulfur fertilization on the sulfur and nitrogen compounds in alfalfa.

Poultry tests reported include the value of high protein mashes in turkey production, capon production, forced molting of yearling hens, and floor heating and ventilation of poultry houses.

[Animal nutrition investigations in Wisconsin] (*Wisconsin Sta. Bul. 439 (1937), pp. 6–15, figs. 3*).—Brief progress reports are presented on the following studies: Vitamin A deficiency as a cause of blindness in farm and laboratory animals, by P. H. Phillips and G. Bohstedt; simple nitrogen compounds as substitutes for protein in livestock feeding, by E. B. Hart, H. J. Deobald, and Bohstedt; the effect of the quality of the protein on the oestrous cycle, by P. B. Pearson, Hart, and Bohstedt; the necessity of fat as a supplement to a skim milk diet for pigs and calves, by E. J. Shantz, C. A. Elvehjem, and Hart; the dietary factor preventing gizzard lesions and swollen gizzard linings resulting from a lack of grit or coarse ingredient in the ration, both by H. R. Bird, J. J. Oleson, Elvehjem, Hart, and J. G. Halpin; soybean oil as a preventive of encephalomalacia in chicks, by A. I. Coombes et al.; dietary factors preventing slipped tendon of chicks, by A. C. Wiese et al.; galactose as a cause of cataract in rats; the effectiveness of chick rations for canary birds, by B. E. Kline and Elvehjem; chemical tests for coumarin and related bitter substances in sweetclover, by K. P. Link et al.; the use of inorganic acids (A. I. V. process), molasses, and wood sugar liquor as preservatives for legume silage, by W. H. Peterson et al.; and the carotenoids in A. I. V. silage, by F. W. Quackenbush and H. Steenbock.

The statistical treatment of experiments involving equalized feeding: The problem of appetite, P. White (*Jour. Dairy Res. [London], 8 (1937), No. 3, pp. 307–310*).—Utilizing the data obtained in the rat-feeding trials noted on page 843, the author has proposed four statistical tests which may be applied to the records of feed refusal by the litter mates in the respective groups to furnish evidence of differences in palatability between different types of feeding stuffs.

Experiments on making hay and silage, I–III [trans. title] (*Beret. Forsøgslab. K. Vet. og Landbohøjskoles [Denmark], 172 (1937), pp. 149; Eng. abs., pp. 129–138*).—Three studies are reported from the Danish Royal Veterinary and Agricultural College.

I. *Experiments on curing hay and ensiling*, N. A. Olesen.—The results of 15 experiments on making hay and silage from pasture crops are reported. The loss of dry matter averaged 13.9 and 11 percent and the loss of crude protein 22.5 and 18.7 percent in the hays and A. I. V. silage, respectively. However, 5.5 percent of the ensiled dry matter had to be discarded due to spoilage on the surface and sides of the silo. With the pH of the A. I. V. silage at 3.8, considerable hydrolysis of true protein occurred. Greater losses of dry matter and protein occurred in silage prepared with molasses than by the A. I. V. process, with a considerable amount of ammonia being formed in the molasses lot.

II. *Experiments on the feeding value of hay and silage*, H. W. Eskedal and P. S. Østergaard.—In trials with milking cows little difference was found in the feeding value of hays cured in cocks and on racks. A. I. V. silage proved slightly superior to hay as a source of nutrients, 5.93 kg of dry matter in the former proving equivalent to 6.76 kg of dry matter in the latter. A comparison of A. I. V. and molasses silage showed a small but consistent advantage in favor of the former. In tests with light and heavy feeding of hay, milk production on the large hay ration compared favorably with that

on the low-hay high-concentrate ration. One hundred kg of dry matter in hay had a starch equivalent of 37 kg.

III. Experiments on the addition of basic supplements to steer rations containing a large proportion of A. I. V. silage, K. Rottensten.—Yearling Shorthorn steers made satisfactory daily gains on a ration in which two-fifths of the feed units were supplied by A. I. V. silage. Such a ration caused a pronounced drop in the alkali reserve of the blood and the pH of the urine and increased the ammonia content of the urine. Additions of sodium bicarbonate in amounts sufficient to neutralize one-half of the acid in the silage largely counteracted the physiological effects of the acid, while similar additions of calcium carbonate were somewhat less effective in this respect. The pH of the digestive tract was not affected by the different feeding treatments.

Making silage from hay crops, A. E. Perkins, C. C. Hayden, C. F. Monroe, W. E. Krauss, and R. G. Washburn (*Ohio Sta. Bimo. Bul. 190 (1938), pp. 3–12, figs. 3*).—The feasibility of making silage from hay crops, including both the legumes and grasses, is pointed out in this discussion.

The beneficial effects of adding molasses or other forms of carbohydrate and of adding mineral acids in preparing such silages, also the conditions under which satisfactory silage may be made without treatment are indicated. In connection with recommendations regarding the proper dry matter content of material to be ensiled, data are presented on the loss of juice from chopped plant material of varying dry matter content when subjected to pressures of from 2 to 12 lb. per square inch, comparable to pressures actually existing at different levels in silos. A clover-alfalfa mixture containing 18 percent dry matter lost 30 percent of the original weight in drainage juice when subjected to a pressure of 8 lb. per square inch. The dry matter loss in this juice amounted to 10.8 percent of the original dry matter in the crop. It is concluded that the proper control of dry matter is probably the most important consideration in silage making.

Practical suggestions are offered with regard to filling the silo.

Carotene (vitamin A) in alfalfa hay, S. T. Dexter and L. A. Moore (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 75, 76*).—In a study of the effects of methods of curing alfalfa hay on its carotene content, second-cutting hay containing 270γ of carotene at the time of cutting was cured in the swarth, in the windrow, and in the cock. After 25 hr., hays cured in the above order contained 147γ, 165γ, and 165γ of carotene, respectively. After 50 hr., at which time the swarth- and windrow-cured lots were ready to be stored in the barn, the hays contained 85γ, 135γ, and 120γ, respectively, and after 4 days in the field they contained 65γ, 110γ, and 120γ, respectively. The windrow-cured and cock-cured lots were equal in carotene content at the time each was ready to go in the barn.

Losses of vitamin A and carotene from feeds during storage, G. S. Fraps and A. R. Kemmerer (*Texas Sta. Bul. 557 (1937), pp. 28*).—In the tests reported cod-liver oil, other fish oils, a concentrate of cod-liver oil, and carotene dissolved in oil were added to various feed mixtures, the mixtures being stored under different conditions and examined for vitamin A or carotene content at periodic intervals. A method for the determination of carotene is described.

After additions of fish oils or their concentrates, 79–100 percent of the vitamin A in the feed mixture disappeared after 4 weeks' storage at either 7° or 28° C. The addition of 0.1 percent of hydroquinone to the mixture as an antioxidant delayed the loss during the first 2 weeks, but 71–87 percent loss occurred after 3 weeks. It is recommended that when such oils are added to feed as a source of vitamin A, the mixture should be fed within 10 days to avoid serious loss of the vitamin.

Carotene in solution in vegetable oil when mixed in feed was more stable than the vitamin A in cod-liver oil. When stored at 7° there was a loss of 2–3 percent, 3–6, and 5–14 percent after 4, 8, and 12 weeks' storage, respectively, while at 28° the loss amounted to 7–27 percent, 12–53, 17–67, and 24–70 percent after 4, 8, 12, and 16 weeks' storage. When carotene in oil is added as a source of vitamin A there apparently should be a liberal allowance for losses during storage.

Alfalfa meal stored for 8 weeks in small quantities lost 6–70 percent of its carotene at room temperature and 0–26 percent at refrigerator temperature. Samples in tightly packed vials at refrigerator temperature lost 0–3 percent per month. A mixture of alfalfa meal-cornstarch 1:9 lost carotene more rapidly than undiluted alfalfa meal. Large samples of alfalfa stored at ordinary temperatures lost carotene very slowly during the winter months but at a relatively rapid rate during the summer months. Losses of as much as 40 percent were found after 3 months' summer storage.

Studies in mineral metabolism, XXXVI, XXXVII (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 8 (1937), No. 1–2, pp. 359–374; pp. 375–414, figs. 15*).—Further contributions are made to this series (E. S. R., 78, p. 381).

XXXVI. *Fluorine metabolism in rats and bovines*, P. J. du Toit, D. B. Smuts, and A. I. Malan.—Two pairs of cows received rations containing 60.6 and 738.4 mg of fluorine per head daily, respectively, for several months and were then subjected to 10-day calcium, phosphorus, and fluorine balance trials. The daily retention of fluorine averaged 9.4 and 242.3 mg, respectively, at the low and high levels of intake. The percentage retention of calcium was slightly increased, but the retention of phosphorus was markedly decreased, at the higher level of fluorine intake. Rats on a high level of fluorine feeding stored approximately 1 mg of fluorine per day but retained decidedly less calcium and phosphorus than rats on a low fluorine diet. The total ash and percentage fluorine in body ash were increased by the heavy fluorine feeding.

XXXVII. *The influence of variations in the dietary phosphorus and in the Ca:P ratio on the production of rickets in cattle*, A. Theiler, P. J. du Toit, and A. I. Malan.—In this extensive investigation, involving 6 pairs of 15-month-old dairy heifers and 5 pairs of 18-month-old steers, experimental feeding was extended over a period of approximately 2 yr. The basal diet was adequate in all respects except in calcium and phosphorus content. The intake of these elements was varied to provide, respectively, a deficiency and sufficiency of phosphorus, with varying amounts of calcium. Data are reported on live weight, feed consumption, calcium, phosphorus, and phosphatase contents in the blood, clinical symptoms of disease, and chemical and histological analyses of bones.

A daily intake of 19 g of P_2O_5 by the steers and 24 g by the heifers proved sufficient for normal growth and development, while 13 and 10 g proved insufficient for steers and heifers, respectively. A $CaO:P_2O_5$ ratio of 2.5:1 when an adequate amount of phosphorus was supplied did not significantly affect the animals. Phosphorus deficiency in the ration invariably resulted in rickets but did not produce oesteodystrophin fibrosa. It is suggested that calcium deficiency may be the responsible factor for the latter condition. The inorganic phosphorus and phosphatase in the blood proved of valuable assistance in following the development of rickets, but blood calcium under conditions of vitamin D sufficiency was of little value in this respect. Portions of ribs were removed from the animals at periodic intervals to aid in diagnosing the bone diseases.

Phosphorus and calcium deficiency diseases as two aetiologically distinct entities, P. J. du Toit and A. I. Malan (*Nature [London], 140 (1937), No. 3534, pp. 153, 154*).—Evidence is cited by the authors to indicate that an insufficiency

of dietary phosphorus in the presence of adequate amounts of vitamin D invariably results in the production of rickets in cattle, sheep, goats, and pigs, whereas a calcium deficiency under conditions of vitamin D sufficiency produces osteofibrosis uncomplicated by rickets, an entirely different bone disease. Osteoporosis is invariably associated with both diseases.

Bone biopsy as an aid to the study and diagnosis of deficiency diseases, A. D. Thomas and J. G. van der Wath (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 8 (1937), No. 1–2, pp. 431–439*).—This article discusses the advantages of bone biopsy in the histological, hemocytological, and biochemical study and diagnosis of nutritional diseases. The technic for obtaining bone samples from the various domestic animals is described.

The essentiality of cobalt in bovine nutrition, W. M. Neal and C. F. Ahmann (*Jour. Dairy Sci., 20 (1937), No. 12, pp. 741–753, figs. 3*).—This is a more comprehensive report of research previously noted (E. S. R., 78, p. 376).

Studies on the mineral requirements of cattle in north-east India (with special reference to rice straw feeding), M. Carbery, I. Chatterjee, and S. K. Talapatra (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 3, pp. 155–211*).—The results of extensive mineral metabolism studies with cattle involving six combinations of feed and 30 individual balance trials are reported. The rations were composed of (1) rice straw alone (winter variety), (2) winter rice straw and rice bran, (3) winter rice straw and linseed cake, (4) rice straw (fall variety), (5) fall rice straw and linseed cake, and (6) winter rice straw, with either green hyacinch, green Napier grass, or green guinea grass. The experimental periods on the various rations ranged from 6 to 18 weeks.

The lowest limits of mineral intake which permitted positive retention, calculated on the basis of the daily requirements of a 500-lb. animal, were CaO 24 g, P_2O_5 10, MgO 15, K_2O 70, Na_2O 17, and Cl_2 20 g. The value of these feeds in meeting the animal requirements and certain observed interrelationships among the ash constituents in mineral metabolism are discussed.

The comparative value of eight protein supplements in stock cattle winter rations, C. W. McCampbell and L. C. Aicher (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1936–37, pp. 7*).—Continuing this study (E. S. R., 75, p. 531), the groups of calves used in the 1935–36 trials were carried on grass during the summer and fed the same experimental winter rations as yearlings in 1936–37. In addition, eight lots of calves were again fed in 1936–37 duplicating the previous trial.

Both calves and yearlings receiving 3 lb. of wheat bran per head daily made the most rapid daily gains, followed closely by the groups receiving 4 lb. of ground alfalfa, confirming previous results that 3 lb. of wheat bran or 4 lb. of ground alfalfa were more valuable as supplements to sorgo silage for wintering stock cattle than 1 lb. of any of the six protein-rich byproducts tested. The ground alfalfa compared less favorably with bran than in the previous trial, indicating the variability in feeding value of different lots of alfalfa. Cottonseed meal promoted the most rapid gains and proved most economical of the protein concentrates, while tankage produced the smallest gains in each series.

Fattening heifers, R. R. Thalman (*Flour & Feed, 38 (1937), No. 3, p. 18*).—Feeding trials at the Nebraska Experiment Station comparing corn, molasses, and a corn-molasses mixture (1:1) as supplements to a ration of drought-damaged corn silage ad libitum and 1.5 lb. of cottonseed cake per head daily for fattening beef heifers gave evidence that molasses was 86 percent as valuable as corn pound for pound during the first 75 days of the feeding period. The mixture of corn and molasses did not significantly increase the rate of gain or

add to the finish of the cattle, but did increase the cost of gain over the straight molasses supplement.

Differentiation of cattle and carabao meat by biochemical methods, R. A. Acevedo and T. Topacio (*Philippine Jour. Anim. Indus., 4 (1937), No. 5, pp. 419–432*).—Continuing these investigations (E. S. R., 76, p. 672), evidence was obtained to indicate that carotene occurs in a different form in the tissue of cattle and carabao, being rather highly colored in the former but practically colorless in the latter. Two methods of extracting carotene from meat samples and determining the intensity of color in the extract are described. By using either of these methods it was possible to differentiate between unrefrigerated and frozen meat of cattle and carabaos with a high degree of accuracy.

Beef-cattle breeds for beef and for beef and milk, W. H. Black (*U. S. Dept. Agr., Farmers' Bul. 1779 (1937), pp. II+21, figs. 21*).—This is a revision of and supersedes Farmers' Bulletin 612 (E. S. R., 32, p. 568).

The Colorado range cattle industry, O. B. Peake (*Glendale, Calif.: Arthur H. Clark Co., 1937, pp. 357, figs. 9*).—This historical narrative describes the early stocking of the State; the removal of Indians from cattle ranges; securing land for the cattle industry; the relation of stock associations to the Colorado range industry; cattle ordinances, regulations, and laws; and the marketing of Colorado range cattle. Much relevant information and an extensive bibliography are appended.

Experiments on the relation of energy-intake to live-weight increase in fattening sheep, J. A. S. Watson, D. Skilbeck, and J. C. B. Ellis (*Empire Jour. Expt. Agr., 5 (1937), No. 18, pp. 180–188, fig. 1*).—This report is based on sheep feeding trials by the School of Rural Economy, Oxford. Regression figures based on the live weight gains of sheep at different levels of feed intake gave evidence that sheep, in addition to energy for maintenance, body growth, and wool production, require 4.4 lb. of starch equivalent for each pound of additional gain, and that this value is quite constant between a plane of nutrition that permitted very slight fattening and one that permitted very rapid gains.

Supplements to hay for wintering breeding ewes, L. H. Blakeslee, G. A. Brown, and J. G. Wells, Jr. (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 72–75*).—In a further report of sheep feeding experiments at the Upper Peninsular Substation (E. S. R., 73, p. 89), tests are described in which breeding ewes received a winter ration of legume hay alone, legume hay plus varying quantities of barley, and legume hay plus cottonseed meal. The lambs from ewes receiving 0.6 lb. of cottonseed meal and 3 lb. of hay daily during gestation averaged 0.83 lb. heavier at birth, 4.41 lb. heavier when turned on pasture, and 7.52 lb. heavier at weaning time than lambs from ewes receiving 4 lb. of hay daily as a sole ration. However, the hay-fed groups of ewes produced heavier lambs than those receiving combinations of hay and barley. Under the conditions described, the feeding of cottonseed meal proved profitable and the ewes came through the winter in better condition than those in the other groups.

Copper deficiency in sheep in Western Australia.—A preliminary account of the aetiology of enzootic ataxia of lambs and an anaemia of ewes, H. W. Bennetts and F. E. Chapman (*Austral. Vet. Jour., 13 (1937), No. 4, pp. 138–149*).—This report from Western Australia describes an enzootic ataxia in lambs which was demonstrated to be primarily due to copper deficiency. Breeding ewes when pastured continuously on areas deficient in copper developed a severe anemia, apparently resulting from a depletion of body stores of copper in an attempt to give the embryo sufficient copper for normal development.

The copper content of the liver, blood, and milk of these anemic ewes and of the liver of affected lambs was considerably below normal. The administration of copper to the ewes during the gestation period prevented or cured the anemic condition and also prevented the incidence of enzootic ataxia in the lambs. It is suggested that blood-copper determinations of lambing ewes might be of considerable prognostic and diagnostic value.

Lamb fattening rations, M. A. ALEXANDER (*Flour & Feed, 38 (1937), No. 4, p. 18*).—Feeding trials were conducted by the Nebraska Experiment Station in which varying amounts of cane molasses were added to different combinations of feeds in lamb fattening rations.

A ration of alfalfa meal-molasses 1:1 failed to give satisfactory finish on the lambs unless corn was added during the latter half of the feeding period, and the allowance of a limited amount of corn with the alfalfa-molasses mixture throughout the feeding period proved more economical. A ration of cane molasses, cottonseed meal, corn silage, and bonemeal likewise failed to give satisfactory finish unless corn was added during the latter half of the feeding period, while a mixture of half corn and half molasses in such a ration proved more economical. Mixtures of crushed barley, molasses, and alfalfa meal 65:25:10 or corn, oats, and molasses 1:1:1 fed with cottonseed meal, corn silage, and bonemeal gave excellent results, increasing the rate and decreasing the cost of gain as compared with the corn-alfalfa hay ration.

Self-feeders for lambs—ration tests: Amounts of oats and dried pulp—alfalfa hay v. natural hay, D. W. CHITTENDEN and A. H. WALKER (*Natl. Wool Grower, 27 (1937), No. 10, pp. 11, 12*).—Five rations were compared for fattening lambs in a feeding trial of 62 days' duration at the Montana Experiment Station. These included (1) oats and dried beet pulp 1:1 self-fed and long alfalfa; (2) oats, beet pulp, and ground alfalfa 1:1:1 self-fed; (3) oats, beet pulp, and ground alfalfa 1:2:1 self-fed; (4) oats, beet pulp, and cottonseed meal 4.5:4.5:1 self-fed and long native hay, and (5) oats, beet pulp, and soybean flakes 4.5:4.5:1 self-fed and long native hay.

The lambs in all lots averaged about 78.5 lb. at the beginning of the test, and the average daily gains were 0.43, 0.47, 0.45, 0.48, and 0.46 lb. per head on rations 1 to 5, respectively. The lambs on the No. 3 ration containing the highest percentage of dried beet pulp required less feed per unit of gain and at prevailing feed prices made materially cheaper gains than any other lot, while feed costs were highest for the lambs on the No. 1 ration. The market grade, dressing percentage, and carcass weight were quite similar for all lots. Lot 1 showed the lowest shipping shrink, and all lots receiving alfalfa hay showed lower cost per unit of carcass weight than those receiving native hay and protein supplement.

Hog feeding experiments, F. B. HEADLEY (*Nevada Sta. Bul. 147 (1937), pp. 30, figs. 10*).—In a series of hog feeding experiments, conducted from 1926 to 1937 in cooperation with the U. S. D. A. Bureau of Plant Industry, tests to determine the optimum levels of alfalfa meal as a supplement to ground barley and skim milk showed that a barley-alfalfa mixture 9:1 with skim milk produced more rapid gains than 20- or 30-percent levels of alfalfa meal. However, the 20-percent level gave nearly as large gains and proved more economical when barley was valued above $20 per ton. Tests in which the pigs in each litter were divided into light-, medium-, and heavy-weight groups indicated that there were only slight differences in the cost of production for these respective groups. Additions of coconut oil meal, linseed meal, or tankage to a barley-alfalfa meal-skim milk ration did not increase the efficiency of the mixture. Three experiments to determine the value of skim milk as a supplement to barley and alfalfa meal showed that a small addition of skim milk replacing a

portion of the barley was of greater value than was indicated by the chemical analysis of the skim milk, but as the proportion of milk in the ration increased its relative value decreased so that with excessive amounts of skim milk its feeding value was less than its theoretical nutritive value. Skim milk proved superior to tankage as a supplement to barley and alfalfa meal. Weanling pigs and 200-lb. pigs required about 2.3 and 4.3 lb. of total digestible nutrients, respectively, per pound of gain. Based on a 10-yr. average of market prices, peak prices occurred in March and in August and September.

The water consumption of suckling sows, F. H. GARNER and H. G. SANDERS (*Jour. Agr. Sci. [England], 27 (1937), No. 4, pp. 638–643*).—A record of the water consumption of 37 Large White suckling sows showed an average daily intake of 42.7 lb. per sow, although a rather wide variation existed between individuals and for the same individual from day to day. The consumption was practically the same in the winter and summer months. There was no relation between consumption and the number or weight of litter, but there was a tendency toward decreased consumption with advance of lactation.

Weaning weight of pigs and litter sampling with reference to litter size, A. D. BUCHANAN SMITH and H. P. DONALD (*Jour. Agr. Sci. [England], 27 (1937), No. 4, pp. 485–502, fig. 1*).—An examination of weaning weights of pigs with respect to litter size by the Institute of Animal Genetics, University of Edinburgh, indicated that, although a significant regression of weight on litter size was found, litter size is a relatively unimportant source of variation.

In a sampling experiment to determine the extent to which a sample might be expected to represent the whole litter, five types of samples were used, namely, (1) four pigs nearest the average of a litter, (2) three pigs nearest the average, (3) two pigs nearest the average, (4) four heaviest pigs, and (5) four pigs chosen at random. The correlations between average rate of live weight increase of the sample and the whole litter were 0.96, 0.92, 0.82, 0.93, and 0.95 for the respective samples. The slight difference between the results from four random and four average pigs indicated the small correlation between weaning weight and subsequent rate of growth. An analysis of postweaning rate of growth showed that the intraclass correlation of pigs of the same weaning weight was 0.15, indicating the slight value of weaning weight for predicting subsequent performance.

Fertility, mortality, and growth rate in pigs, A. W. MENZIES-KITCHIN (*Jour. Agr. Sci. [England], 27 (1937), No. 4, pp. 611–625, figs. 3*).—The farrowing and litter performance records of certain purebred and cross-bred groups of swine have been analyzed by the School of Agriculture, Cambridge.

Large White, Large Black, and Large White × Large Black cross-bred sows averaged 10.2, 8.6, and 9.3 live pigs per litter, with 76.2, 82.4, and 83.1 percent surviving at 6 weeks of age, respectively. There was no evidence of significant deterioration in litter size or in litter weight at 6 weeks of age up to the tenth in the litter, but the percentage death rate tended to increase with the litter number. In litters containing more than 12 pigs the addition in number was more than offset by an increase in death rate. The greatest mortality occurred during the third and fourth weeks of the suckling period. The average weight of pigs at 6 weeks of age was not related to the size of litter at birth, but was inversely related to the number of pigs surviving to this age. The percentage survival of pigs to 6 weeks was considerably higher for those farrowed in summer than for the winter-farrowed groups. However, the winter-farrowed pigs reached 200 lb. live weight about 10 days earlier than the summer-farrowed group. Weight at 6 weeks of age was negatively correlated with age at which pigs reached bacon weight, although the postweaning rate of growth was quite similar for the light and heavy pigs. Rapid growth rate and high grading were

not incompatible when good stock and proper feeding and management were employed.

The nutrition of the bacon pig.—II, The influence of high-protein intake on protein and mineral metabolism, H. E. Woodman, R. E. Evans, and W. G. Turpitt (*Jour. Agr. Sci. [England], 27 (1937), No. 4, pp. 569–589*).—Continuing this study (E. S. R., 77, p. 84), the utilization of food protein and the retention of calcium, phosphorus, and chlorine at different levels of protein intake has been determined by balance trials at intervals throughout the growth period of bacon pigs.

Young pigs after weaning digested their food equally as efficiently as more mature animals, and the extra protein at high levels of protein intake had little or no effect on the digestibility of the ration. At no stage of the trial was there evidence of protein in the urine of the pigs on the high-protein diet. Gilts consistently showed a higher rate of nitrogen retention than male litter mates. High levels of protein intake did not result in a greater nitrogen retention than was obtained at normal protein levels, and the daily nitrogen retention remained quite constant throughout the period from weaning to 200 lb. live weight. There was a close relationship between the mean nitrogen balance and the degree of leanness in the typical bacon sample submitted for examination. Calcium and phosphorus balances indicated that 200-lb. pigs still have a relatively high requirement for these elements, while the pigs' demand for food chlorine is very small and is amply supplied by ordinary good rations. High planes of protein feeding had no significant effect on the mineral metabolism.

The use of various forms and amounts of skim milk with potatoes for fattening swine [trans. title], H. Bünger, A. Werner, J. Schultz, E. Fissmer, and E. Schelper (*Landw. Jahrb., 84 (1937), No. 2, pp. 279–312*).—With fattening pigs up to 120 kg of live weight receiving steamed potatoes ad libitum and limited amounts of cereal meal, 0.3 kg of fish meal or 0.15 kg of fish meal and 2 l of sour skim milk per head daily proved better protein supplements than sour skim milk alone. The fish meal group consumed more potatoes than the skim milk group. With the above rations there was no advantage of allowing more than 0.7 kg of cereal meal per head daily. When meal was fed without potatoes skim milk proved superior to fish meal as a supplement. The daily consumption of 50 g of lactic acid per head in sour skim milk showed no deleterious effect when fed with fresh steamed potatoes, but resulted in lower rates of gain when fed with acid-ensiled potatoes.

Experiments on the use of raw sugar beets for fattening swine [trans title], I. Schmidt, I. Kliesch, and E. Reddelien (*Ztschr. Schweinezucht, 44 (1937), No. 8, pp. 115, 116*).—Three groups of pigs having average initial live weights of about 70 kg per head were fed a basal diet of ground barley, ground rye, and herring meal 5:3:2 at the rate of 1 kg per head daily plus an ad libitum supplement of (1) steamed potatoes, (2) a mixture 1:1 of steamed potatoes and raw sugar beets, and (3) chopped raw sugar beets. The pigs made average daily gains of 704, 663, and 498 g and required respectively 294, 312, and 429 g of digestible protein and 3.43, 3.13, and 3.61 kg of starch equivalent per kilogram of gain. It is considered that under the Lehman system of feeding raw sugar beets are unsatisfactory as a sole supplementary feed, even for older pigs.

A comparison of dried root crops and grain in pig fattening rations [trans. title], E. Frölich and F. Haring (*Ztschr. Schweinezucht, 44 (1937), Nos. 11, pp. 157–159; 12, pp. 173–175*).—A group of pigs receiving a ration of potato flakes, dried sugar beets, ground barley, and fish and meat meal 38:30:21:11

made average daily gains of 600 g per head as compared with gains of 700 g per head daily for a group receiving a check ration of ground barley and fish meal 91 : 9. The former group required about 17 days longer to reach an average weight of 100 kg. Feed costs on the two rations were approximately the same. Similar results were obtained with an experimental ration composed of potato flakes, dried beet tops, ground barley, and fish meat meal 37 : 32 : 20 : 11.

Studies on nutritive efficiency of commercial dog foods, A. ARNOLD and C. A. ELVEHJEM (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 5, pp. 515–531, figs. 4*).—Previously noted (E. S. R., 78, p. 384).

Poultry management in subtropical, semiarid climates, B. W. HEYWANG (*U. S. Dept. Agr. Circ. 446 (1937), pp. 20, figs. 7*).—The discussion of poultry management problems set forth in this circular is based primarily on experimental studies and observations made in the Salt River Valley of Arizona and includes breed adaptation, the selection of breeding stock, the production and care of hatching eggs, incubation and brooding, housing and feeding the young flock and the mature stock, care of market eggs, and disease and parasite control.

Livability of layers may be predetermined by management of the chicks, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 190 (1938), pp. 17–20*).—In this further report (E. S. R., 76, p. 524), a summary is presented of 11 tests comparing the livability and egg production of laying pullets which had been reared under isolated conditions entirely apart from the mature flock (preventive management) with similar groups of laying pullets which had been reared in close proximity to the station flock (nonpreventive management).

When subjected to the same conditions during the laying year, the mortality of all pullets reared under the preventive management system averaged 28 percent as against 59 percent mortality for those grown under nonpreventive management. Egg production during the year on a hen day basis was 182 and 147 eggs and on the basis of the original number of birds in the pens 158 and 102 eggs for the preventive and nonpreventive management lots, respectively. These results indicate that such a system of preventive management of chicks and growing pullets offers an immediate partial relief from the losses of pullet layers where an acute disease and internal parasite situation exists.

Hopper-feeding grain to laying pullets: A comparison of continuous hopper feeding of grain with daily hand feeding, J. A. DAVIDSON (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 94–98*).—In further trials (E. S. R., 76, p. 230), the continuous hopper feeding of corn and wheat was compared with litter feeding (hand-fed at 4 p. m. daily) of these grains to laying pullets of the White Leghorn and Rhode Island Red breeds. The trials extended over a 10-mo. period. A satisfactory mash was fed, and oats, ground poultry bone, and oystershell were continuously available in separate hoppers.

The percentage mortality and average egg production of each breed was very similar under the two feeding methods. With each breed the groups having constant access to grain consumed more grain and less mash than the litter-fed groups. The consumption of oats by White Leghorns was approximately the same under the two methods, but the litter-fed Rhode Island Reds consumed considerably more oats than the hopper-fed birds. The hopper feeding of grain is considered most satisfactory, although it complicated the supplying of sufficient vitamin D and also required more hopper space. It is suggested that pullets fed in this manner should have been raised by hopper feeding during the growing period.

The effect of partial or total oviduct removal on the calcium content of the blood of pullets, H. J. DEOBALD, J. B. CHRISTIANSEN, E. B. HART, and J. G. HALPIN (*Poultry Sci.*, *17* (*1938*), *No. 1*, *pp. 94–96*, *fig. 1*).—In a study at the Wisconsin Experiment Station to determine whether the oviduct was connected in any way with blood calcium, the oviducts were entirely or partially removed from 20 White Leghorn pullets at 6–8 weeks of age. Fifteen pullets surviving this operation and 5 normal controls were bled at biweekly intervals to study the blood calcium changes.

The very close similarity of the blood calcium rise and fall of the altered and normal pullets at the period of maturity indicated that no part of the oviduct can be considered a factor in the observed rise in blood calcium when pullets reach laying age. The removal of all or part of the oviduct had no observed physiological effect on the pullet. In cases where the upper oviduct was removed the yellow pigment from resorbed ovulated yolks was deposited in the skin. This was particularly noticeable by the recoloring of the vent and beak during active ovulation.

Recovery from the anemia caused by a diet deficient in vitamin K, S. A. THAYER, R. W. MCKEE, D. W. MACCORQUODALE, and E. A. DOISY (*Soc. Expt. Biol. and Med.*, *Proc.*, *37* (*1937*), *No. 2*, *pp. 417–420*).—Employing essentially the same basal diet and active preparations of vitamin K as described by Almquist (E. S. R., 76, p. 581), the authors showed that young chicks reared on the vitamin K-deficient diet developed a prolonged blood clotting time and also a profound anemia. Chicks suffering from such disorders showed complete recovery within a period of 3 days after minute amounts of vitamin K had been administered. The addition of 0.5 percent of alfalfa leaf meal to a basal diet prevented the occurrence of such abnormalities.

Fatty livers in the goose produced by overfeeding, E. FLOCK, J. I. BOLLMAN, H. R. HESTER, and F. C. MANN (*Jour. Biol. Chem.*, *121* (*1937*), *No. 1*, *pp. 117–129*).—Fatty livers in geese produced through forced feeding of a high carbohydrate diet and also those developing spontaneously during the egg-laying season were compared with normal livers as regards total fatty acids, the proportion of solid to liquid fatty acids, iodine number, cholesterol, glycogen, and water.

In those produced by forced feeding the fat was definitely more saturated than in normal livers, the liver fat being even more saturated than the depot fat. This condition was not accompanied by a significant shift in the usual proportion of liquid to solid fatty acids. In the spontaneous fatty livers the degree of saturation was intermediate between those for the normal and forced fed groups. In some cases the neutral fat of the blood increased as the livers became fatty, although such increases were inconsistent and were seldom 50 percent above that in birds with normal livers.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle in Oregon] (*Oregon Sta. Bul. 350* (*1937*), *pp. 22, 23, 33, fig. 1*).—Results are briefly noted on the value of irrigated pastures for dairy cattle, nutritional problems associated with rations consisting principally or solely of alfalfa, the use of molasses and mixtures of phosphoric and sulfuric acids in the preparation of legume and grass silages, and the feeding value of cull apples for dairy cows.

[Investigations with dairy products in Wisconsin] (*Wisconsin Sta. Bul. 439* (*1937*), *pp. 60–71, figs. 3*).—Results are briefly noted on the effect of adding vitamin C to milk on the development of oxidized flavors and on tests for copper, by J. P. Turgeon, V. C. Stebnitz, and H. H. Sommer; the necessity of proper pasteurization in making sweet cream butter and the relation of lipase to bitter

flavor in milk, both by K. G. Weckel, H. C. Jackson, and D. W. Jones; microscopic studies of processed cheese, by H. D. Templeton, Sommer, et al.; sediment tests for cheese and factors influencing acidity in brick cheese, both by D. W. Spicer and W. V. Price; improved methods of preparing Swiss cheese starter cultures, by H. J. Peppler and W. C. Frazier; heat resistance in cultures, by Frazier and P. R. Elliker; preventing deterioration of cheese brines, by G. B. Landerkin and Frazier; and an improved design in milk irradiators, by H. H. Beck, Jackson, and Weckel.

The relative values of raw and pasteurized milk in the feeding of calves, J. Wilkie, S. J. Edwards, A. B. Fowler, and N. C. Wright (*Jour. Dairy Res. [London], 8 (1937), No. 3, pp. 311–323*).—In trials at the Hannah Dairy Research Institute, bull calves were fed on raw or commercially pasteurized milk to 12 weeks of age at the rate of 10 percent of their live weight daily. In addition they received hay from the eighth week to the end of the experimental period. Forty-two and 50 calves were started on the pasteurized and raw milk rations, respectively, and of these 37 pasteurized-milk-fed and 36 raw-milk-fed calves completed the 12 weeks' feeding.

No apparent differences were noted in the skeletal growth of the two lots. The slight advantage in live weight gain in favor of the group on pasteurized milk was not significant, but the condition of this group at the end of the trial was consistently adjudged to be superior to the raw-milk-fed group. The inoculation of aliquot samples of the milks into guinea pigs at regular intervals gave evidence that 70 percent of the raw samples contained viable tubercle bacilli and 38 percent contained *Brucella abortus*, while pasteurized samples were uniformly negative to both tests. Twenty-four of the 36 calves receiving raw milk reacted to the tuberculin test at the end of the trial and active lesions were found in 23 of them, while only one calf receiving pasteurized milk reacted and no lesions could be found in this animal.

It is concluded that while pasteurization had no apparent effect on the nutritive value of the milk it had a distinct advantage in protecting the calves from infection through drinking milk which contained live tubercle bacilli.

The nutritive value of milk supplemented with minerals as an exclusive diet for rats: Comparison of equal volumes of summer and "winter" milk before and after laboratory pasteurization, K. M. Henry, E. W. Ikin, and S. K. Kon (*Jour. Dairy Res. [London], 8 (1937), No. 3, pp. 282–306, figs. 2*).—In an investigation at the National Institute for Research in Dairying milk was obtained simultaneously from cows on early pasture and from stall-fed cows receiving winter rations. These milks were standardized to a uniform fat content, and a portion of each was pasteurized at 145°–150° F. for 30 min. The nutritive values of these milks were compared in two series of feeding trials with rats (groups of 12 on each diet).

In the first series, milk supplemented with iron, copper, and magnesium was fed as the sole diet, the intake of each group being equalized. At the end of 8 weeks' feeding no significant differences were found in live weight, body length, general appearance, or carcass analysis of the rats on the various milk diets. Summer milk appeared to be slightly more palatable than winter milk, but pasteurization did not affect palatability.

In the second series, 20 cc of milk per rat daily was fed in addition to unlimited access to a deficient basal diet of acid-washed casein, sugar, and salts 24:72:4. After 8 weeks' feeding a comparison on the basis of gain in live weight, intake of basal diet, and gain per unit of solids ingested showed only small variations between rations. The only significant differences were in favor of pasteurized summer milk over raw summer milk and pasteurized winter milk. At the end of the 8-week experimental period the addition of 5

percent of dried brewers' yeast to the basal diet resulted in marked increase of growth in all groups. It is concluded that these tests did not reveal any differences in the total nutritive value of the milks being compared.

The effect of light on the vitamin C of milk, S. K. Kon and M. B. Watson (*Biochem. Jour., 30 (1936), No. 12, pp. 2273–2290, figs. 7*).—In a series of experiments at the National Institute for Research in Dairying it was shown that milk giving a positive test for vitamin C (reduced ascorbic acid) failed to reduce a standardized indophenol reagent after 1 hour's exposure to daylight through glass. Treating the exposed milk with hydrogen sulfide partially restored its reducing power, with evidence that the reversible oxidation occurring under the action of light follows the laws of a unimolecular reaction. Certain irreversible losses always occurred under these conditions. Exposure of milk to various sources of light through glass and through quartz gave evidence that visible light of short wavelengths is mainly responsible for such reaction. Ultraviolet light showed some activity, while yellow and red lights were almost without effect in this respect. Red and brown cellophane wrappers proved highly protective against the deleterious effect of light, while lemon, blue, and heliotrope wrappers were much less effective. Replacing the oxygen dissolved in milk by an inert gas, such as nitrogen, prevented this action by light.

Tests with guinea pigs showed that the reversibly oxidized substance formed by the action of light was biologically active, but that the irreversible decomposition products were devoid of activity. A pint bottle of milk exposed to sunlight for 30 min. and then stored in darkness for 1 hr. lost fully one-half of its original antiscorbutic properties. Milk as secreted contained only reduced ascorbic acid. Pasteurization by the holder method destroyed the irreversibly oxidized but did not affect the reduced form of ascorbic acid. Hence the amount of destruction of vitamin C by pasteurization in the absence of catalytic agents depended on the previous exposure of the milk to sunlight.

The size of fat globules in goat's milk, J. C. Marquardt (*Goat World, 22 (1937), No. 4, pp. 3–5*).—The New York State Experiment Station measured the fat globules in 7 samples of mixed herd goats' milk representing the early stages of lactation. Globules ranged from 1μ to 15.5μ in diameter, with 71 percent falling in the range of from 2μ to 4μ and with an average of 3.79μ for the entire series. Similar measurements of another lot of 45 mixed herd samples covering a lactation period range showed 91 percent of all globules to fall within the class of 1μ to 4μ, with an average of 2.36μ for the series. It is concluded that while the variation in size of fat globules in goat's milk is great the majority fall within a rather limited range. The need for improved measuring technics and for organized study to determine the true mean value of fat globule size in both cows' and goats' milk is stressed.

Bacteriology and mycology applied to dairying, A. T. R. Mattick, E. R. Hiscox, and J. G. Davis (*Jour. Dairy Res. [London], 8 (1937), No. 3, pp. 369–405*).—This comprehensive review of recent research deals with the following subjects: (1) Technics in milk production and control, (2) micro-organisms in milk and milk products, (3) lactic acid and allied fermentations, and (4) pasteurization and other processes. The bibliography contains 368 references to recent literature.

Prevalence and classification of hemolytic streptococci in pasteurized milk, L. W. Slanetz (*New Hampshire Sta. Tech. Bul. 70 (1938), pp. 12, figs. 4*).—Frequent examination of samples of pasteurized milk from nine different dairies over a period of 2 yr. showed weakly hemolytic streptococci to be widely prevalent in such milk. Sheep blood agar proved to be well suited for the detection and isolation of these organisms. They could not be detected by the standard

plate method, but moderate growth was obtained on tryptone-glucose-skim milk agar. This condition is suggested as one explanation for the higher counts obtained from milk samples on this medium than on standard nutrient agar.

Improperly sterilized utensils were shown to be the major source of contamination of these streptococci. Sixty strains of these organisms were isolated and studied in detail, and their major characteristics are indicated. All were of the alpha prime hemolytic type. Fifty-six of the strains were classified as *Streptococcus bovis*, 12 of which were of variety A, 25 of variety B, 11 of variety C, and 8 of variety D. The C and D varieties apparently had not been described previously in the literature. The remaining 4 strains were classified as *S. fecalis*. Large numbers of these heat-resistant streptococci in milk are undesirable and warrant efforts to detect and eliminate them.

Comparison of solid with liquid media as a means of determining the presence of lactose fermenting bacteria in pasteurized milk, M. W. YALE (*Amer. Jour. Pub. Health*, *27* (*1937*), *No. 6*, *pp. 564–569*).—A comparison at the New York State Experiment Station of brilliant green bile broth, formate ricinoleate broth, desoxycholate agar, and violet red bile agar as media for determining the presence of lactose-fermenting bacteria in pasteurized milk led to the following conclusions: (1) False tests rarely occur either in brilliant green or formate ricinoleate broth when pasteurized milk is examined; (2) under the test conditions described all red acid-forming colonies larger than 0.5 mm in size which develop on these solid media either belong or are closely related to the coliform group; however, it is recommended that these be designated as red or acid colony counts until their identity is more definitely established; (3) single broth tubes are sufficiently accurate for qualitatively examining bottled street samples of pasteurized milk for the presence of coliform organisms; (4) for such purposes the single tube is preferable to the single plate, since it is simpler and quicker; and (5) the plate method has definite advantages where quantitative results are desired as a follow-up to positive qualitative tests.

The phosphatase test for determining efficacy of pasteurization, E. H. PARFITT (*Milk Plant Mo.*, *27* (*1938*), *No. 1*, *pp. 34*, *36*, *38*, *40*).—The author describes certain American modifications of the phosphatase test developed in England (E. S. R., 76, p. 91) and indicates their usefulness in the control of milk pasteurization.

Twenty-third annual report of the creamery license division, T. H. BINNEY (*Indiana Sta. Circ. 233* (*1937*), *pp. 16*).—This is the usual report (E. S. R., 77, p. 387) of the number of creamery licenses issued and the number of testers' licenses granted during the year ended March 31, 1937. The licensed dairy manufacturing plants in the State on October 1, 1937, are listed.

Instant whipping of cream by aeration, C. A. GETZ, G. F. SMITH, P. H. TRACY, and M. J. PRUCHA (*Food Res.*, *2* (*1937*), *No. 5*, *pp. 409–428*, *figs. 7*).—This contribution from the Illinois Experiment Station describes a process whereby whipped cream is produced without mechanical agitation by dissolving large quantities of a soluble gas (nitrous oxide in this case) under pressure in liquid cream and then allowing the cream to flow out from under the gas pressure. With cream at atmospheric pressure the gas that was forced to dissolve, due to elevated pressure, comes out of solution in the form of small gas bubbles uniformly distributed throughout the body of the cream. The amount of gas which can be dissolved in the liquid cream increases in direct proportion as the pressure is increased, and the amount of overrun in the whipped cream depends on the amount of gas thrown out of solution. Fresh cream subjected to 200 lb. pressure for 48 hr. yielded over 600 percent overrun when released. The overrun was independent of the fat content when fresh cream was used. The rigidity or stiffness of the whip depended on many factors, most important of which were percentage

of butterfat, overrun, temperature of the cream, and age of the cream. When aged cream was whipped the overrun was not so high at any given pressure as for fresh cream, this tendency becoming more pronounced as the fat content increased. Homogenized creams gave excellent overrun by this method. Cream homogenized at 400 lb. pressure gave an excellent quality whip, but at high homogenization pressures the whip was less rigid than that from comparable ordinary cream. Additions of gelatin or sodium alginate to increase the stability of the whip proved effective. These substances and also high homogenization pressure increased the viscosity of the cream so that prolonged shaking was required to saturate the cream with the gas.

Discoloration and corrosion in canned cream, II, C. J. Jackson, G. R. Howat, and T. P. Hoar (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 3, pp. 324–330*).—Continuing this study (E. S. R., 77, p. 95), it is shown that cream from abnormal milks, cans coated with inferior quality tin plate, excessive amounts of stabilizer in cream, and excessively high temperatures and long holding periods during sterilization are important factors in the development of discoloration and corrosion in canned cream. The mechanism of the attack is described.

Bitterness and thinning in canned cream, A. A. Nichols, G. R. Howat, and C. J. Jackson (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 3, pp. 331–346, figs. 2*).—In studies at the Hannah Dairy Research Institute, cultures of organisms isolated from defective commercially canned cream were inoculated into normal canned cream, and the effects on the quality and character of the product were noted after varying intervals of incubation at 25°, 32°, and 37° C. These organisms were found to be strains of *Bacillus subtilis*, the spores of which were capable of withstanding temperatures of 120° for as long as 40 min. Their morphological and cultural characteristics are described.

The development of bitterness and thinning was more rapid at the higher temperatures and varied with the different strains. All samples incubated at 37° and most of those at 32° were thin at the end of 2 weeks, while cans at room temperature were unaffected after 5½ weeks of storage. Chemical tests showed that both bitterness and thinning were associated with the break-down of protein. The marked change in viscosity was primarily due to alteration in the continuous (liquid) phase of the product, since the percentage of fat and the extent of fat globule clumping were only slightly affected.

Investigations on Gotland on improving the quality of butter.—III, Treating cream in the A. P. V. vacuum holder to prevent onion flavor in butter [trans. title], B. Platon and T. Olsson (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 471* (*1936*), *pp. 16; Eng. abs., pp. 15, 16, fig. 1; also in K. Landtbr. Akad. Handl. och Tidskr., 76* (*1937*), *No. 1, pp. 53–66, fig. 1; Eng. abs., pp. 65, 66*).—Continuing these studies (E. S. R., 76, p. 388), a series of experiments is reported in which cream separated from onion milk was passed through a vacuum holder at 85°–90° C., and then aerated over a surface cooler. This treatment was repeated (generally three times) until no onion flavor could be detected in the cream. When butter churned from untreated and treated lots of cream was scored at 7–12 days of age and again 1 week later the butter from untreated cream was invariably of strong onion flavor while that from the vacuum-treated cream was found to have onion flavor but to a much lower degree. Absolutely fresh butter from the treated cream did not have an onion flavor and was not discriminated against by the consumer. Comparison of sweet-cream and sour-cream butter from treated cream indicated that ripening the cream favorably influenced the quality of the butter, especially when fresh.

Use of anti-oxidants to prevent tallowiness in butter, W. J. Corbett and P. H. Tracy (*Natl. Butter and Cheese Jour., 28 (1937), No. 24, pp. 10, 12, 14*).—The results obtained at the Illinois Experiment Station indicate the effectiveness of adding 1 percent of oat flour or the aqueous extract of an equivalent amount of oat flour to cream in retarding the development of oxidized flavors in butter. A hexane extract of oat flour proved less effective for this purpose than the oat flour or its aqueous extract. Wrapping butter in parchment treated with oat flour also retarded the development of surface flavor and slightly improved its keeping quality. These results essentially confirmed those reported by the Pennsylvania and Oklahoma Experiment Stations (E. S. R., 78, p. 244).

Effect of adding milk to agar on the plate count of butter, E. G. Pont and H. V. Rees (*Jour. Austral. Inst. Agr. Sci., 3 (1937), No. 4, p. 227*).—Additions of 0.5, 1, 2, and 5 percent of sterile milk to standard nutrient agar in the routine bacterial examination of butter samples gave average counts 22.4, 31.9, 25.5, and 33.6 percent higher, respectively, than those obtained on the unsupplemented standard nutrient agar. The addition of 1 percent of milk appeared to be most satisfactory, since it gave less turbidity than higher concentrations and apparently was well above the minimum concentration required to produce significant increases in counts.

The effect of using tryptone-glucose-skimmilk agar and 32° C. incubation on the bacterial colony count of ice cream, M. W. Yale and R. C. Hickey (*Jour. Dairy Sci., 20 (1937), No. 12, pp. 755–760, fig. 1*).—The New York State Experiment Station has compared the logarithmic average bacterial counts obtained on standard nutrient agar plates incubated at 37° and on tryptone glucose skim milk agar plates at 32° for 112 samples of ice cream.

Counts on the modified medium at 32° were higher than the standard agar counts in 92 percent of all cases, with an average percentage increase in count of 162 percent. Furthermore, it appeared that the number of colonies on standard agar plates did not represent a constant proportion of the total number capable of development. It is concluded that the use of standard nutrient agar at 37° is a poor instrument for use in quality measurements of ice cream.

VETERINARY MEDICINE

[Work in animal pathology by the Oregon Station] (*Oregon Sta. Bul. 350 (1937), pp. 17, 25–27*).—The work of the biennium 1935–36 (E. S. R., 73, p. 98) with poultry diseases, including coccidiosis and fowl pox; sterility in cattle; the blood-sedimentation test for pregnancy; effects of reinfection and significance of low titer reactions to Bang's disease; mastitis in cattle; liver flukes and lungworms in cattle, sheep, and goats; use of acidophilous milk in treating white scours in lambs and calves; fern poisoning of cattle; and infection in castration and docking is briefly reported.

[Work in animal pathology by the Wisconsin Station] (*Wisconsin Sta. Bul. 439 (1937), pp. 53–55, 72–78, figs. 2*).—Factors affecting the accuracy of tuberculin testing, by E. G. Hastings, J. R. McCarter, H. R. Getz, and R. H. Stiehm; work with sulfur as a preventive for avian coccidiosis, by C. A. Herrick, C. E. Holmes, J. G. Halpin, and H. J. Deobald, of which earlier accounts have been noted (E. S. R., 77, p. 546; 78, p. 541); chronic coccidiosis in the fowl resulting from coccidia, intestinal bacteria, and lowered resistance, by G. L. Ott, Herrick, Halpin, and Holmes; relationship between abnormal milk and mastitis, by Hastings; power of blood serum to combat Bang's disease organism, by M. R. Irwin and L. C. Ferguson in cooperation with the U. S. Department of Agriculture; and the inability of ceased reactors to the agglutination test for Bang's

disease to transmit the disease, by B. A. Beach and G. C. Humphrey, are considered in this brief report of the work of the year (E. S. R., 77, p. 538).

Guide to post-mortem diagnosis, with directions for dissection, L. Lund (*Pathologisch-anatomische Diagnostik an Tierleichen mit Anleitung zum Sezieren. Hannover: M. & H. Schaper, 1935, 2. ed., pp. IX+327, figs. 131*).—A second and enlarged edition of the work previously noted (E. S. R., 62, p. 166).

Preparation of pathological specimens from animal tissues and their mounting under watch glasses, J. S. Bengston (*U. S. Dept. Agr. Circ. 454 (1938), pp. 14, figs. 9*).—Detailed directions are given for the preservation and mounting under watch glasses of pathological specimens from animal tissues. Properly prepared watch-glass specimens are deemed valuable for educational and exhibit purposes and serve as authentic scientific evidence of pathological and other abnormal conditions found in animals.

Studies in chemotherapy.—VII, Some new sulphur compounds active against bacterial infections, H. Bauer and S. M. Rosenthal (*Pub. Health Rpts. [U. S.], 53 (1938), No. 2, pp. 40–49, figs. 2*).—Of the new derivatives of sulfanilamide and disulfanilamide prepared and tested against streptococci and pneumococci, a single compound of this group, viz, sufanil *p*-aminoanilide, proved to be slightly superior to sulfanilamide. The conclusion that much more favorable results are obtained with disulfanilamide when it is injected in oil than when given orally was confirmed. Administered by mouth disulfanilamide has a therapeutic index twice as great as sulfanilamide.

The contribution is in continuation of previous work (E. S. R., 78, p. 532), particularly as relates to the therapeutic value of sulfanilamide.

Sulphanilamide and virus diseases, E. B. McKinley, E. G. Acree, and J. S. Meck (*Science, 87 (1938), No. 2246, pp. 43, 44*).—In considering the negative results that have been obtained in the use of sulfanilamide in the experimental treatment of virus infections it is pointed out that such infections are invariably of an intracellular nature, while bacterial infections are chiefly intercellular, though in some bacterial diseases cellular invasion is also characteristic. It is suggested that sulfanilamide is unable to exert its action against the infecting agent when it has invaded the tissue cells as in the case of virus infections.

Iso-amyl-ortho-cresol: A new anthelmintic, M. A. Stewart (*Cornell Vet., 27 (1937), No. 4, pp. 338–348*).—The author has found isoamyl-*o*-cresol to be a highly efficient anthelmintic in the treatment of *Dipylidium caninum* infestation in dogs when administered at the rate of 0.1 cc per pound of body weight followed by a purgative of magnesium sulfate in water. Ordinarily, a complete elimination of this cestode results from a single treatment. This chemical is highly selective in its anthelmintic effect upon cestodes and will not bring about the elimination of such tapeworms as *Taenia multiceps*, *T. seriatus*, and *D. sexcoronatus*.

Specificity relationships between types of arsenicals and types of trypanosomes, M. L. Kuhs and A. L. Tatum (*Jour. Pharmacol. and Expt. Ther., 61 (1937), No 4, pp. 451–458*).—Several organic arsenicals that were effective in curing *Trypanosoma lewisi* infections in the rat were found ineffective when administered against *T. equiperdum* infection in the rat.

Acute Senecio poisoning, P. T. Carpenter (*[War Dept. U. S.], Off. Surg. Gen., Vet. Bul., 32 (1938), No. 1, pp. 32–41, figs. 3*).—This contribution, which supplements the results of an investigation of plant poisoning by *S. riddellii* conducted at the Nebraska Experiment Station (E. S. R., 61, p. 768), reports upon four cases of poisoning naturally acquired from *S. riddellii* and several experimental cases.

It was found that *Senecio* plants are very widespread in certain parts of the encephalomyelitis area in northwestern Nebraska, where studies were conducted; that these plants seem to reach their maximum toxicity during the encephalomyelitis season; and that such cases would have been 100 percent fatal had it not been for good nursing and care.

Studies of physical properties and agglutinability of Br[ucella] abortus plate antigens from several sources, II, C. P. FITCH, M. H. ROEPKE, and C. M. THOMPSON (*Cornell Vet., 27 (1937), No. 4, pp. 366–378*).—The physical properties and the agglutinability of 14 plate antigens studied at the Minnesota Experiment Station (E. S. R., 77, p. 102) indicate that there are still very wide variations in these products. "Uniform methods of production and use would simplify and increase the efficiency of Bang's disease control plans now in operation in the various States. It would be well for those States having importation regulations governing Bang's disease to carefully investigate the plate antigens used to test animals for entry. The results here reported should be of particular interest to commercial manufacturers who are preparing plate antigens for Bang's disease testing. The methods of production and standardization should receive more attention from those engaged in Bang's disease control work."

Brucella infection in white mice, C. H. SINGER-BROOKS (*Jour. Infect. Diseases, 60 (1937), No. 3, pp. 265–278, figs. 2*).—The possibility of substituting the white mouse for the guinea pig in diagnostic and experimental studies of *Brucella* infections led to the investigation reported.

It was found that "normal white mice succumb quickly to large doses of living *Brucella* organisms (300,000,000 to 400,000,000). Normal mice subjected to smaller dosage (30,000,000 to 300,000) organisms manifest no symptoms of infection but develop necrotic areas in the liver and enlargement of the spleen. Infections of 100,000 to 1,000 organisms do not produce gross anatomical change, but the organisms are harbored in various tissues for long periods of time. Protection against fatal infection was conferred by immunization with heat-killed vaccine in 95 percent of the animals treated. Pregnancies in immunized mice subjected to lethal infection are not terminated by abortions. The young survive and develop into healthy adults. Immunized mice subjected to small infections do not manifest any appreciable increase in ability to free their tissues of *Brucella* organisms as compared with control mice."

A study of Brucella infection and immunity in humans, I. F. HUDDLESON and M. MUNGER (*Amer. Jour. Trop. Med., 17 (1937), No. 6, pp. 863–880*).—The results of a study of 8,124 individuals to determine the extent of *Brucella* infection and immunity are reported from the Michigan Experiment Station.

"The status of the individuals regarding *Brucella* infection and immunity was determined by the aid of the brucellergin skin test, the opsonic test, the agglutination test, blood, stool, and urine culture. Of the total number examined, 845, or 10.3 percent, gave a positive skin test, 7.1 percent were classified as infected, 2.7 percent as immune, and 0.52 percent as questionably immune. No significant differences were noted between the incidence of infection and immunity in male and female groups. The size of the skin reactions in approximately 50 percent of those individuals who were positive fell between 25 and 75 mm. Of the 222 classified as immune, 47.3 percent showed insignificant serum agglutination titers. Of the 436 classified as infected, 90.5 showed insignificant agglutination titers.

"In a retest of 99 negative individuals after an interval of 5 mo., 9 were found to have developed an allergy to *Brucella* during the interval. Of those, 5 were classified as infected and 4 as immune. In a retest of 108 individuals previously classified as infected, 3 had become negative, 38 immune,

and [67] were still classified as infected. Of the 84 retested in the immune group, 80 retained the same classification and 4 were classified as infected.

"The allergic response to four different dilutions of brucellergin was compared in 185 *Brucella*-sensitive individuals. When a dilution of brucellergin higher than 1:2,000 is employed, a slight decrease is noted in its activity. The 1:2,000 dilution should always be used for diagnostic purposes, but for epidemiological surveys in the general population a dilution of 1:25,000 may be employed with a high degree of accuracy."

Influence of host factors on neuroinvasiveness of vesicular stomatitis virus, III, IV, A. B. SABIN and P. K. OLITSKY (*Jour. Expt. Med., 67 (1938), No. 2, pp. 201–228, pls. 4, fig. 1; pp. 229–249*).—In continuation of earlier studies of the vesicular stomatitis virus (E. S. R., 77, p. 541), part 3 deals with the effect of age and pathway of infection on the character and localization of lesions in the central nervous system, and part 4 with variations in neuroinvasiveness in different species.

Influence of contaminating bacteria on the results of the microscopic test for streptococcic mastitis, C. S. BRYAN and E. A. NELSON (*Amer. Jour. Pub. Health, 27 (1937), No. 9, pp. 914–917; abs. in Michigan Sta. Quart. Bul., 20 (1937), No. 2, p. 115*).—The authors have found that the microscopic examination of properly collected milk samples incubated at 37° C. for at least 12 hr. is an accurate means of diagnosing streptococcic mastitis in dairy cows. The large numbers of contaminating bacteria which enter the milk as a result of improper technic and those that reproduce therein may overshadow the microscopic field, thereby obscuring the streptococci that may be present in small numbers. "In addition, metabolic products of the contaminating bacteria may inhibit the growth of the streptococci. *Escherichia coli*, *Bacillus subtilis*, and *Staphylococcus aureus* in decreasing order alter the accuracy of the results of the microscopic test. Bacteria other than streptococci that may be present in the udder and therefore present in the milk sample do not greatly interfere with the accuracy of the microscopic test for streptococcic mastitis, since the reproduction of the streptococci is only slightly reduced in their presence. *Brucella abortus* and micrococci are of this type. Placing 0.1 cc of a sterile 1–500 aqueous dilution of brilliant green into each tube prior to collecting a 10 cc sample gives a final dilution of 1–50,000 brilliant green in the milk. This dye greatly inhibits these contaminants, thereby increasing the efficiency of the test if such bacteria are present. It is essential to use proper technic in the collection of milk samples so that contaminating bacteria do not gain entrance and to be sure that the streptococci present do not get in from sources outside the udder. In addition, the dye should be added as a preservative to inhibit the bacteria that may invade the udder and thereby be present in the sample."

The specificity of the virus of rabbit myxomatosis, L. B. BULL and C. G. DICKINSON (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 4, pp. 291–294*).—The authors' investigations have led to the conclusion that the virus of rabbit myxomatosis is highly specific and infective only for the European rabbit (*Oryctolagus* spp.). The tame varieties of the genus are somewhat more resistant than the wild rabbit, and man, monkeys, domesticated animals, hares, and the native animals of Australia have all been proved to be quite refractory to the virus.

The prevalence of trichinosis, C. H. SCHEIFLEY (*Amer. Jour. Hyg., 27 (1938), No. 1, pp. 142–148, fig. 1*).—In examinations made of human muscle in Minneapolis and St. Paul, Minn., 12.7 percent of 118 cadavers were found to be trichinous. Evidence presented indicated that the incidence of trichinosis among the adults of the United States is approximately 20 percent.

Experiments on contagious abortion, I, II, A. D. McEwen (*Vet. Rec., 49 (1937), No. 51, pp. 1585–1596*).—The first part of this contribution (pp. 1585–1589) deals with the infectivity of *Brucella abortus* strain 45 for cattle; the second (pp. 1589–1596), with field immunization experiments with a vaccine prepared from strain 45.

The subcutaneous inoculation of noninfected pregnant cattle with large numbers of living *B. abortus* strain 45, 36,000 million bacteria and more, did not cause infection of the uterus or the udder. "The intravenous inoculation of very large numbers of this strain into pregnant heifers caused uterine infection and abortion, but it did not cause an udder infection, and, furthermore, it is probable that the infection it caused was a transient one. The strain after recovery from an aborted fetus was still nonpathogenic for guinea pigs. It was concluded that in view of the inability to produce an infection of the pregnant uterus and of the udder in animals inoculated subcutaneously, the inability to demonstrate any udder infection in animals inoculated intravenously, and the nonpathogenicity of the strain recovered after passage through the bovine, there was no objection to using a live vaccine prepared from this strain in infected herds."

In vaccination trials conducted on commercial dairy herds using a living culture of strain 45 for vaccine, in which pregnant and nonpregnant cows were inoculated, there was no evidence that the inoculations were injurious to the cattle. The results of these trials are considered sufficiently encouraging to justify a critical experiment on the value of this vaccine where groups of noninfected animals are vaccinated and others left as controls, and where later the individual animals in all groups are submitted to experimental infection.

Bovine allergic dermatitis (?).—A preliminary report, E. E. Leasure and E. J. Frick (*Cornell Vet., 27 (1937), No. 4, pp. 331–337*).—Investigations conducted by the Kansas Experiment Station revealed that allergic dermatitis, also known as wheat poisoning, blistering disease, itching disease, weed poisoning, fagopyrism, light sensitization, etc., occurred over the entire State of Kansas, especially the western two-thirds. It was reported to have occurred also in Nebraska, Colorado, Oklahoma, Missouri, and Iowa. The incidence of occurrence in cattle was from 1 to 40 percent in the herds having five or more head. The disease makes its appearance in March and continues through April, May, and the first part of June. The mortality rate is low, being less than 1 percent. The loss is chiefly a result of a decreased milk flow and loss of flesh. Exposure to the direct rays of the sun appears to be a factor in producing the disease. "It is believed that some substance eaten by the animals while on pasture sensitizes the skin, which, in turn, is activated by the sun's light rays. Almost without exception the white markings and the nonpigmented hairless areas were those affected.

"Animals on poor winter rations seemed to be affected to a greater extent than those on a balanced ration. The disease was observed chiefly in lactating or pregnant cows and in sows (the diagnosis being questionable in the sows). Tumbling mustard was not found to contain the sensitizing substance or to produce the disease in the experiments conducted. Calcium gluconate and glucose solutions seemed to be beneficial in the early stages of the disease. Ointments and oils were beneficial in restoring the epidermis and hair to the affected areas and as fly repellents."

Ephemeral or three-day fever in northern Queensland: Its diagnosis and some preliminary investigations, C. R. Mulhearn (*Austral. Vet. Jour., 13 (1937), No. 5, pp. 186–191*).—An account is given of an epizootic disease of bovines in northern Queensland that is considered to be identical with ephemeral

fever or 3-day sickness of Africa and other countries. The disease was readily transmitted by blood inoculation but not by contact or by drenching with urine, feces, or saliva. Attempts to transmit the disease with filtrates from Seitz EK and K disks and Pasteur-Chamberland L2 candles were unsuccessful. The disease could not be transmitted to horses, sheep, goats, or small laboratory animals.

Some views concerning the significance of mastitis, D. H. UDALL (*Cornell Vet., 27 (1937), No. 4, pp. 395–404*).—A summary of information regarding the public health significance of mastitis of dairy cows.

Bovine mastitis in relation to milk-borne epidemics, D. J. DAVIS (*Jour. Infect. Diseases, 60 (1937), No. 3, pp. 374–380, figs. 3*).—Experiments reported indicate clearly that "hemolytic streptococci applied to the teat surface will readily ascend the teat ducts to the milk cisterns, setting up an infection. Similar experiments using strains of staphylococci have given negative results. However, when staphylococci of human origin are injected into the lactiferous duct a short distance above the meatus the infection will 'take,' resulting in a definite and easily recognized mastitis. The possible role of injuries in both *Streptococcus* and *Staphylococcus* infections is emphasized.

"A brief presentation of the anatomy and histology of the teat ducts pertinent to this problem is given; also some observations relating to the pathology of the udder as a focus of disease."

The use of the complement-fixation test in the control of bovine pleuropneumonia, H. W. BENNETTS (*Austral. Vet. Jour., 13 (1937), No. 5, pp. 178–183*).—In an outbreak of bovine pleuropneumonia in cattle in Western Australia, in the northwest of which it has been enzootic for many years, the disease was not eradicated from a herd of 92 cattle by the slaughter of positive reactors to a series of six complement-fixation tests. The failure is attributed partly to the rather long intervals between tests and to some delay in removing reactors to the first two, but principally to one factor—the long incubation period of the disease. The correlation between serological and post-mortem findings in the case of 89 animals, where the requisite data were available, was almost complete. It is considered, therefore, that the failure was not due to any unreliability in the test itself, and that this test provides a highly reliable method for the diagnosis of bovine pleuropneumonia.

A note on the application of the complement-fixation test to the control of bovine pleuro-pneumonia, A. W. TURNER and A. D. CAMPBELL (*Austral. Vet. Jour., 13 (1937), No. 5, pp. 183–186*).—A description is given of the procedure recommended in the application of the complement-fixation test to the control of bovine pleuropneumonia in herds in which prophylactic vaccination had not been carried out.

Self-limitation and resistance in Trichomonas foetus infection in cattle, J. ANDREWS (*Amer. Jour. Hyg., 27 (1938), No. 1, pp. 149–154*).—Observations are reported which show that infection with *T. foetus* produced by inoculation is self-limiting. The susceptibility of recovered animals is altered so that they are no longer receptive to the infection even when repeatedly introduced. This reaction is believed to be evidence of the development of resistance the nature of which is unknown.

Studies on tuberculosis and tuberculin reactions in cattle, N. PLUM (*Skand. Vet. Tidskr., 27 (1937), No. 11, pp. 589–685, figs. 9; Swed. abs., pp. 682–685*).—The work reported includes investigations made of the length of time that animals keep reacting to intracutaneous injections of tuberculin when administered at weekly intervals, the reason for the failure to react to repeated injections of tuberculin, the reactions due to infection with avian tubercle bacilli, the

experimental infection of bovine-infected stock with avian tubercle bacilli and with avian tubercle bacilli in sound stock, double infection, factors in the variations of the intracutaneous tuberculin reaction of an animal at different times, and type determination.

Parasitic gastro-enteritis of calves, D. W. Baker (*Cornell Vet., 27 (1937), No. 4, pp. 381–394, figs. 3*).—The distinctive features in the diagnosis of parasitic gastroenteritis of calves and the pathogenicity of *Ostertagia ostertagi* and *Cooperia oncophora* under natural conditions are considered.

A note on the colour responses of Lucilla cuprina, D. J. Lee (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 4, pp. 275, 276*).—In a test made of lights as attractants for *L. cuprina*, the most important source of sheep strike in Australia, yellow was found to rank first, followed in order by blue, pink, and green.

The persistence of stomach worms on bluegrass pasture, W. G. Kammlade, R. Graham, and L. E. Boley (*Amer. Soc. Anim. Prod., Proc., 29 (1936), pp. 169–172*).—The results of observations of the persistence of larvae of the sheep stomach worm *Haemonchus contortus* on bluegrass pasture in Illinois, based upon microscopic examination of the ova in feces of sheep in 1936, are presented in table form. The findings suggest that the larvae of this parasite, when deposited during a season preceding such a winter as that of central Illinois in 1935–36, are of much less importance as a source of infestation than are the adult parasites carried through the winter in the animal host.

Parturient paresis, or milk fever, in goats, A. J. Durant (*Amer. Goat Soc. Yearbook, 1937, pp. 77, 78*).—Contributing from the Missouri Experiment Station, attention is called to the fact that, while no cases of milk fever in goats have been reported in the literature, high-bred, heavy producing goats are subject to milk fever, as has been demonstrated by the author. A brief report is made of a case of milk fever in a high-bred doe.

The cellular response in acquired resistance in guinea pigs to an infection with pig ascaris, K. B. Kerr (*Amer. Jour. Hyg., 27 (1938), No. 1, pp. 28–51, pl. 1*).—In experiments conducted with a view to determining whether a true, acquired immunity can be established against the pig ascaris, *Ascaris lumbricoides suis*, it was found that both single and multiple sublethal doses, given at varying intervals, would induce a resistance to an otherwise lethal dose of ascaris eggs. This resistance was sufficient to permit guinea pigs to survive an infection of about twice the average lethal dose, but it was not so effective against a second test infection and was also of relatively short duration. A list of 25 references to the literature is included.

Non-transmissibility of trichinelliasis in pig, M. Hobmaier (*Science, 86 (1937), No. 2241, p. 542*).—A sow with a body weight of approximately 550 lb. that had been fed about 3,000 3- to 4-month-old Trichinellas each on the thirty-fifth, fifty-sixth, eightieth, and one hundred and third day of its pregnancy failed to transmit the parasite to any of a litter of 11 pigs, as determined by post-mortem examinations made during the first 6 weeks after birth. Examinations made of the diaphragm of the sow revealed the presence of 434 Trichinellas per gram of muscle.

Trypanosoma simiae and acute porcine trypanosomiasis in tropical Africa, C. A. Hoare (*Roy. Soc. Trop. Med. and Hyg., Trans., 29 (1936), No. 6, pp. 619–645, figs. 3*).—This contribution deals with the etiology of an acute form of trypanosomiasis due to *T. simiae* that occurs among pigs in tropical Africa. *T. congolense*, which causes the chronic infection without appreciably impairing the health of the animal, is said to be the only species commonly found in the domestic pig.

On the nomenclature of the trypanosome causing acute porcine trypanosomiasis in Africa, C. A. Hoare (*Bul. Soc. Path. Exot., 30 (1937), No. 8, pp. 686–693; Fr. abs., p. 692*).—This contribution, which supplements the work above noted, calls attention to the fact that *Trypanosoma simiae* Bruce 1912 has priority over *T. porci* Schwetz 1932, and, since the name *T. suis* Ochmann 1905 is not valid, is the correct name for the trypanosome causing acute trypanosomiasis of pigs in Africa. It is presented with a list of 18 references to the literature.

Studies on so-called cornstalk disease in horses.—V, Feeding experiments, J. D. Mizelle and R. Graham (*Cornell Vet., 27 (1937), No. 4, pp. 374–380*).—In the experiments reported (E. S. R., 76, p. 852) "horses were fed corn chaff, molds (*Aspergillus*, *Penicillium*, *Botryosporium*, *Actinomyces*, and unidentified mycotic forms), a moldlike organism (one of the *Actinomycetales*), and a mixture of molds and bacteria isolated from the encephalon of natural cases of the disease and presumably 'infected' corn material. Feeding periods varied from 4 to 61 days. Corn chaff and some of the above-mentioned organisms (one of the *Actinomycetales*, unidentified molds, and bacteria) were also fed to rabbits, guinea pigs, and chickens from 19 to 62 days. No symptoms of so-called cornstalk disease were observed during any of the feeding experiments. Stated in another way, the artificially propagated moldlike organism and bacteria from equine encephalons obtained from natural cases of the disease, corn or corn leaves and stalks obtained from fields in which natural cases of so-called cornstalk disease had occurred induced no clinical symptoms when fed to experimental animals, and it is apparent that the data obtained in this work have given no clue as to the nature of the etiological agent or agents of so-called cornstalk disease in equines."

Details of experimental feedings of molds are presented in table form.

Equine encephalomyelitis ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 32 (1938), No. 1, pp. 60–62, 63–68*).—In reporting upon results obtained in 1937 from various therapeutic measures, it is stated by E. L. Nye and N. F. Christensen (pp. 60–62) that 150 of the 168 animals that were vaccinated and 72 of the 78 to which serum was administered were protected and that 38 of the 43 receiving medical treatment recovered. This protection of more than 90 percent of the animals treated by vaccination and serum is considered very satisfactory and sufficient to justify the use of these products. It is pointed out that of 18 cases developing after the use of vaccine 6 recovered with no further treatment, and of 6 cases occurring after the administration of serum 5 recovered with no additional attention. There was a high percentage of recoveries (88+ percent) from medical treatment.

In the second contribution (pp. 63–68) data are presented on the 1937 outbreak of equine encephalomyelitis, which was felt principally in the States west of the Mississippi River and especially between the Mississippi and the Rocky Mountains. The outbreak is said to have been more serious than any previously experienced and more severe than the outbreaks occurring in other sections of the country. Present reports show that mules are far less frequently affected than horses, and that when affected they seem to have the disease in a milder form and are more likely to recover.

The treatment of canine distemper with a chemotherapeutic agent, sodium sulfanilyl sulfanilate, A. R. Dochez and C. A. Slanetz (*Science, 87 (1938), No. 2250, pp. 142–144, figs. 4*).—The authors found that the experiments here reported "clearly indicate that sodium sulfanilyl sulfanilate, when administered to ferrets experimentally infected with canine distemper, both prevents the disease when given before the appearance of symptoms and cures the disease promptly when administered shortly after the development of character

istic symptoms and fever. There is some evidence to indicate that serious secondary bacterial infection accompanying the distemper may destroy the favorable action of the drug. One treated ferret died 25 days after the discontinuance of the drug. At autopsy consolidated areas were found in the lungs, the exact nature of the disease not being apparent. Whether this animal died because of latent activity of the virus or was reinfected from a nearby diseased ferret is unknown. Treated ferrets remain remarkably free from symptoms, maintain a good appetite, and in general gain weight. No toxic manifestations were observed with a dosage of 1 g daily. When the dose was increased to 2 g daily, diarrhea and loss of weight appeared."

The drug was also given a short clinical trial in spontaneous canine distemper in dogs. The effects thus far seem to be of equal value to those observed in the experimental disease. Of 28 animals treated at varying stages of the disease 26 recovered. The symptoms and fever disappear rapidly and the appetite promptly returns. The animals remain well after the cessation of treatment. One animal treated on the fifth day of the disease recovered within 48 hr. and thereafter remained well. The amount of drug administered to the dogs was 1 g twice daily.

Eighteen cats suffering from a spontaneous disease commonly known as cat distemper or influenza were also treated with the drug. Its effect in this condition was in all respects similar to that in canine distemper.

Sodium sulfanilyl sulfanilate therefore appears to be the first chemical agent to have such definite therapeutic action in an infection due to a filtrable virus. The range of its activity in virus disease remains to be explored.

The sparing effect of canine distemper on poliomyelitis in Macaca mulatta, G. Dalldorf, M. Douglass, and H. E. Robinson (*Jour. Expt. Med., 67 (1938), No. 2, pp. 333–343, fig. 1*).—A detailed report is made of experiments in which monkeys (*M. mulatta*) suffering from canine distemper were found highly resistant during the first 2 weeks to intracerebrally inoculated poliomyelitis virus.

The sparing effect of dog distemper on experimental poliomyelitis, G. Dalldorf, M. Douglass, and H. E. Robinson (*Science, 85 (1937), No. 2198, p. 184*).—This preliminary contribution relates to the work above noted.

Death losses increasing in pullet flocks, E. S. Weisner (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 80–85*).—A report is made on the diseases and conditions contributing to or causing the death of pullets in the Michigan egg-laying contest since its beginning on November 1, 1922, including the first 8 yr. previously reported upon by Stafseth and Weisner (E. S. R., 65, p. 473), the details being presented in table form. The information given is based upon autopsies and the cultures made of various organs and tissues.

The last 7 yr. have shown an average mortality of 26.53 percent as compared with 18.98 for the first 8 yr., the average for the 15-yr. period being 22.12 percent. These figures show definitely that pullet losses are the limiting factors of a successful poultry enterprise.

The reaction of chickens to certain members of the colon-paratyphoid group of bacteria, C. Olson and G. R. Goetchius (*Cornell Vet., 27 (1937), No. 4, pp. 354–366*).—In experiments conducted 20 chickens, divided into 4 groups of 5 fowls each, were given 10 daily intravenous inoculations with *Salmonella anatum aertrycke*, which had been isolated from the intestinal content of fowls affected with paralysis, and sterile saline solution. A marked heterophilic granulocytosis was observed in those chickens receiving the bacteria intravenously. Those inoculated with *S. anatum aertrycke* showed the highest counts, and all the fowls died from 12 to 24 days after the beginning of the experiment. Most of the chickens survived after receiving intravenous inoculations

and their blood counts returned to normal. Lameness due to arthritis associated with *S. anatum aertrycke* infection was observed in the fowls receiving that micro-organism. "No instances of transmissible fowl leucosis or fowl paralysis were observed among the experimental animals. Two cases of lymphocytoma of the ovary occurred, one of which was in a control chicken. We were unable, therefore, to substantiate the claim of Emmel [E. S. R., 78, p. 256] that these diseases may be produced with such bacteria."

Leukosis in fowls, A. NYFELDT (*Skand. Vet. Tidskr., 27 (1937), No. 10, pp. 509–577, pl. 1, figs. 8; Eng. abs., p. 571*).—This contribution is presented with a list of 59 references to the literature. Descriptions are given of the three forms of leucosis, viz, myeloblastosis, lymphatic leucosis, and erythroblastosis. The first- and last-mentioned forms are considered to be transmissible and lymphatic leucosis of fowls nontransmissible.

The inheritance of resistance to fowl paralysis (neurolymphomatosis), C. D. GORDON (*Alabama Sta. Rpt. 1936, p. 16*).—A brief progress report.

Agglutinin content of eggs from Salmonella pullorum infected hens, N. A. FRANK and B. H. EDGINGTON (*Poultry Sci., 16 (1937), No. 6, pp. 442–444*).—In work by the Ohio Experiment Station, "yolk and albumen from 495 eggs laid by 21 hens having *S. pullorum* titers of their blood serum ranging from incomplete at 1:50 to partial at 1:1,600 were tested by the stained-antigen-plate method. Agglutinins were demonstrated in the yolk of each egg but in no instance in the albumen. Complete agglutination of the antigen occurred regularly with yolk material from eggs produced by 6 of these hens. Eggs from the other hens gave reactions that varied from complete to a mere trace of agglutination. Ninety-two of these eggs, the total number laid during October, November, and December, were cultured for *S. pullorum* with negative results. Blood collected from each of the 21 hens at the time of autopsy gave complete agglutinations in the whole-blood-plate tests. *S. pullorum* cultures were obtained from discolored ova of 20 of the 21 hens. Material obtained at the time of autopsy from apparently normal but incompletely developed ova gave complete agglutination with yolk from 18 of the hens and incomplete with that from 3. Agglutination of the antigen usually was most rapid and the clumps largest with material from the high-titer birds."

Studies on the life history and economic importance of Heterakis gallinae (Gmelin 1790, Freeborn 1923), the caecum worm of fowls, F. H. S. ROBERTS (*Austral. Jour. Expt. Biol. and Med. Sci., 15 (1937), No. 4, pp. 429–439, figs. 4*).—Examinations of fowls made by the author in the Brisbane district in South Australia have shown 89.7 percent to be parasitized by *H. gallinae*, although heavy infestations are rare. At 33° C., the optimum temperature for development of this roundworm, eggs develop infective larvae in 5 days, the first molt occurring on the fourth day. "There are three molts in the parasitic life cycle, namely, on the fourth to sixth, ninth to tenth, and about the fourteenth day, respectively. Maturity is reached in 24 days. The young larvae invade the cecal epithelium of the host soon after infection, but within 2 to 5 days return to the lumen of the bowel, where they complete their development."

Studies on incubator hygiene.—IX, The disinfecting properties of formaldehyde for hemophilic bacteria associated with avian coryza, the filtrable viruses of infectious laryngotracheitis, and infectious bronchitis, R. GRAHAM and C. A. BRANDLY (*Poultry Sci., 16 (1937), No. 6, pp. 428–433*).—In continuation of the studies on incubator hygiene (E. S. R., 76, p. 695) the authors report having found that the results of subjecting two hemophilic bacteria associated with avian coryza, two strains of laryngotracheitis virus,

and one strain of bronchitis virus to formalin in amounts of 16⅔ cc per 100 cu. ft., in a forced-draft incubator, with relative humidity of approximately 68 percent (wet bulb reading of 90° to dry bulb of 100° F.), tend to support the value of fumigation procedures previously recommended for suppressing dissemination of pullorum disease in forced-draft incubators.

Two hemophilic bacteria from cases of avian coryza were nonviable after 60 min. in five fumigations. Laryngotracheitis virus in aqueous and broth suspensions was nonviable after 30 min. in one fumigation, while the dried finely powdered virus was viable in two fumigations after 90 min. Avian bronchitis virus in dried finely powdered form was nonviable after 60 minutes' fumigation.

"On the basis of preliminary results, fumigation procedures recommended for the prevention of incubator-disseminated pullorum disease may be effective in destroying certain respiratory infections that have gained entrance to the incubator. However, it is apparent that dried laryngotracheitis virus may survive 90 fumigation minutes, emphasizing the necessity of thorough cleaning in successful fumigation of a forced-draft incubator."

Diseases of turkeys, W. R. Hinshaw (*California Sta. Bul. 613 (1937), pp. 112, figs. 56*).—A practical summary of information on the diseases and parasitic enemies of the turkey, with 63 references to the literature cited.

Hemorrhagic enteritis in turkeys, B. S. Pomeroy and R. Fenstermacher (*Poultry Sci., 16 (1937), No. 6, pp. 378–382, figs. 4*).—This contribution from the Minnesota Experiment Station reports upon the finding of an acute hemorrhagic enteritis at the autopsy of 35 turkey poults made during June, July, and August 1936. The ages of these poults, which originated from widely separated farms in Minnesota, varied from 7 to 12 weeks. The disease appeared in flocks of several hundred birds as well as in those of several thousand or more. The mortality averaged approximately 10 percent.

Escherichia coli communis was isolated from the liver and heart of a few cases as was a Gram-positive, slender bacillus. The organisms recovered were not considered to be of primary importance so far as etiology is concerned. Test tube antigens prepared from the various species of *Salmonella* failed to detect the presence of agglutinins in the blood serums at 2- and 4-week intervals following inoculation. The results of post-mortem, histopathological, hematological, bacteriological, and serological examinations and of animal inoculations are reported.

The present status of pullorum disease in turkeys, W. R. Hinshaw (*Nulaid News, 15 (1937), No. 9, p. 12*).—A further summary (E. S. R., 76, p. 856) of the present knowledge of pullorum disease of turkeys, contributed from the California Experiment Station.

Some blood parasites from Nebraska birds, G. R. Coatney and R. L. Roudabush (*Amer. Midland Nat., 18 (1937), No. 6, pp. 1005–1030, figs. 44*).—Observations on the protozoan genera *Haemoproteus*, *Leucocytozoon*, *Plasmodium*, and *Trypanosoma*, with notes on the immature nematode group microfilaria, are reported. Eighty-nine different birds representing 19 families and 44 species were examined. Of this group 26 were found to harbor one or more genera of blood parasites. Descriptions of 4 species and 2 varieties of *Haemoproteus* and 2 varieties of *Leucocytozoon* new to science and a list of 45 references to the literature are included.

AGRICULTURAL ENGINEERING

Report of the Chief of the Bureau of Agricultural Engineering, 1937, S. H. McCrory (*U. S. Dept. Agr., Bur. Agr. Engin. Rpt., 1937, pp. 24*).—This report presents progress results of investigations conducted on grain and potato

storages, silos, and corncribs; icing citrus fruit in transit; durability of drain tile; drainage of sugarcane lands; control of ground water in peat and muck soils; irrigation in the humid region; duty of water; evaporation losses; water spreading (see below); combines; mechanical placement of fertilizer; preparation of land for cotton and corn hill spacing of check-planted corn; sugar beet, cotton, and pyrethrum harvesting; vapor spraying for insect pests; and farm operating for maximum efficiency.

[**Agricultural engineering investigations by the Alabama Station, 1934–35**], R. E. Yoder, M. L. Nichols, F. A. Kummer, A. Carnes, and E. G. Diseker (*Alabama Sta. Rpt. 1934–35, pp. 9–12*).—The progress results are briefly reported of investigations on a method for making aggregate analysis of soils, the physical nature of erosion losses from Cecil clay, adhesion between soil and metal surfaces, development of mathematically perfect plow surfaces for experimental work, soil crust formation and its relation to cotton stands, and the effect of various crops on soil erosion control.

[**Agricultural engineering investigations by the Alabama Station, 1936**], F. A. Kummer and D. F. King (*Alabama Sta. Rpt. 1936, pp. 9, 10, 15*).—Progress results are briefly reported of investigations on the relationship of the dynamic properties of soil to the elements of tillage implement design and sack-cement poultry house construction .

[**Agricultural engineering investigations by the Oregon Station**] (*Oregon Sta. Bul. 350 (1937), pp. 36–38, figs. 2*).—The progress results are briefly reported of investigations on drying shelled corn by forced draft with heated air; high-pressure pea sprayer; filbert and prune drying; and electric brooding.

[**Engineering studies by the Wisconsin Station**] (*Wisconsin Sta. Bul. 439 (1937), pp. 40–48, figs. 2*).—Results are noted of studies by M. J. La Rock and E. C. Meyer on means to get better heated farmhouses; by F. W. Duffee and H. D. Bruhn to develop a small rotary sprinkler irrigation system; by Duffee, Bruhn, L. F. Graber, G. Bohstedt, B. H. Roche, and E. B. Hart on the effect of chopping hay on storage requirements; the design of hay storage structures; by Duffee and Bruhn on the increased safety of electric fence; and by Duffee on the use of dual rubber tires on tractors.

Spreading water for storage underground, A. T. Mitchelson and D. C. Muckel (*U. S. Dept. Agr., Tech. Bul. 578 (1937), pp. 80, pls. 22, figs. 38*).—This bulletin presents a large amount of information obtained from various experimental studies, from which the conclusion is drawn that spreading water for underground storage is no longer an experimental undertaking and presents great possibilities. Apparently it can be practiced with more or less success in any region where pumping from wells is the principal means of furnishing water supply. In many cases it has been found more economical than surface storage, because the works necessary for storage are not as extensive or costly and there is no evaporation loss.

It has been found that, other factors being equal, the highest percolation rates are returned on land with the native vegetation and soil covering least disturbed. It appears that the consumptive use by vegetation is negligible in comparison with its beneficial effect on the percolation rate.

Although temperature has some effect on the rate of percolation, the change in temperature of the water during the spreading season is usually so small that its effect is overshadowed by other more important factors. Furthermore, it is an uncontrollable factor in the spreading of flood waters.

The ground water has no marked effect on the percolation rate until it comes in actual contact with the saturated soil extending a few inches below the ground surface. When this contact is made a very sharp decrease in the rate

of percolation takes place. Maximum percolation rates are obtained during the period the ground-water level drops after it has made contact with the ground surface. The reason for the maximum rates at this time is not definitely known, but is probably due, in part, to the partial vacuum formed by the falling water table. The ground surface is sealed by the spreading water, which is then drawn underground as the vacuum is created. The effect of the dropping water table on the percolation occurs only during the first few feet of drop.

Percolation rates in basins or ponds, with the vegetation removed, decrease with the continued application of water. This decrease is due to re-sorting of the soil particles and puddling of the soil surface.

Higher rates of percolation in basins may be maintained by frequent harrowing or raking of the ground surface. Water containing silt should not be spread in still pools, such as basins or ponds. In the ditch system of spreading carrying velocities should be maintained so as to insure the carriage of suspended matter throughout the length of the ditches. Because of the high cost of sinking shafts or pits, their use is not economical if surface spreading can be employed. On streams subject to large floods, adequate works should be provided to control completely the amount of water diverted at all times. Reception ditches are recommended at the lower boundaries of spreading areas in order to return excess water back to the stream of origin and provide protection to lower lands.

The floods of March 1936.—Part 2, Hudson River to Susquehanna River region (*U. S. Geol. Survey, Water-Supply Paper 799 (1937), pp. X+380, pls. 12, figs. 49*).—This volume presents outstanding facts for the above region. Part 1 presents similar information for the New England rivers (E. S. R., 78, p. 404).

Major Texas floods of 1936, T. Dalrymple et al. (*U. S. Geol. Survey, Water-Supply Paper 816 (1937), pp. V+146, pls. 12, figs. 33*).—This report, prepared in cooperation with the Federal Emergency Administration of Public Works, deals primarily with June, July, and September storms and the resultant floods of 1936 and includes a brief summary of available information about previous floods.

Flood in La Cañada Valley, California, January 1, 1934, H. C. Troxell and J. Q. Peterson (*U. S. Geol. Survey, Water-Supply Paper 796–C (1937), pp. IV+53–98, pls. 19, figs. 10*).—This flood is briefly described.

The conservation of Montana's irrigated lands, P. L. Slagsvold and H. H. Lord (*Montana Sta. Bul. 350 (1937), pp. 32, figs. 8*).—The results of investigations are reported which were conducted in cooperation with the U. S. D. A. Bureau of Agricultural Economics and Agricultural Adjustment Administration. The purposes of the study were (1) to determine the extent and nature of soil depletion on irrigated land in Montana and (2) to determine from a study of farm organization and soil management practices the adjustments which might be helpful in conserving the soil.

It was found that (1) erosion from poor use of irrigation water, (2) leaching and seepage, (3) failure to maintain a balance between soil depleting and leguminous soil conserving crops, (4) a deficiency in livestock numbers, (5) failure to use commercial fertilizer where needed, and (6) the encroachment of weeds upon farm land are active soil and fertility depleting factors on some farms in all of the irrigated areas studied. However, there is a notable difference in the frequency and severity of these factors in the different areas, growing primarily out of differences in the general type of farming and in farm practices.

Dairying, together with a large proportion of soil conserving crops in the Bitterroot Valley, and beet production, together with dairying and livestock fattening in the Yellowstone area, are farm organization characteristics which

are maintaining and in some cases increasing yields on the better managed farms. On the other hand, a high proportion of cash grain which is not balanced by leguminous soil conserving crops, livestock, or commercial fertilizer is a factor contributing to soil depletion and low yields in the Sun River area.

Poorly constructed irrigation ditches and irrigation of unprotected sloping lands are resulting in an increasing erosion problem in some of the irrigated areas studied. Soil depletion from this cause could in many cases be reduced by running the ditches on a more gradual grade and by the protection of the more sloping farm land with grass and hay crops. Better use of irrigation water and avoidance of its waste would reduce soil depletion by leaching and would aid in reducing the seepage of lower lands.

Experimental evidence indicates that a fifty-fifty division between soil depleting and soil conserving crops, plus a livestock enterprise to provide a market for hay and pasture, and the conserving and skillful use of barnyard manure, is the general type of farm organization which seems adapted to the maintenance of an agronomic balance on the irrigated farms in the areas studied. The practice of plowing up the leguminous crops at regular periods might also be followed, especially where crop yields are not maintained through manuring.

Weed control is a serious problem in most irrigated areas and frequently requires community action for most effective handling.

A method for finding terrace cross sections, H. W. LeMert and A. W. Zingg (*Agr. Engin., 18 (1937), No. 7, pp. 296, 300, fig. 1*).—A quick, practical method is described for measuring terrace ridge and channel cross sections which has been developed by the U. S. D. A. Soil Conservation Service. Tabular data are included to facilitate use of the method.

Wildlife conservation through erosion control in the Piedmont, R. O. Stevens (*U. S. Dept. Agr., Farmers' Bul. 1788, pp. II+26, figs. 20*).—This shows in a practical manner how gullies, terrace outlets, waterways, eroding field borders, pastures, and woodlands in the Piedmont region may be protected against erosion through the use of vegetation that will also provide food and cover for wildlife.

Public Roads, [January–February 1938] (*U. S. Dept. Agr., Public Roads, 18 (1938), Nos. 11, pp. [2]+201–215+[1], figs. 4; 12, pp. [2]+217–235+[1], figs. 27*).—The numbers of this periodical contain data on the current status of various highway projects receiving Federal funds as of December 31, 1937, and January 31, 1938. No. 11 also contains an article entitled Present Knowledge of the Design of Flexible Pavements, by A. C. Benkelman (pp. 201–212), and No. 12 one entitled The Structural Design of Flexible Pipe Culverts, by M. G. Spangler (pp. 217–231).

Electrical moisture meters for wood, M. E. Dunlap (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1937, pp. [1]+4*).—Instruments now available for the measurement of moisture in wood by rapid electrical methods are briefly described.

Comparative tests of fuels in low-compression tractors, E. L. Barger (*Agr. Engin., 18 (1937), No. 7, pp. 311–314, figs. 11*).—Laboratory and field experiments with five fuels and three tractors conducted by the Kansas Engineering Experiment Station are reported. The fuels included premium-grade gasoline of 75 to 80 octane, regular-grade gasoline of 70 to 75 octane, third-grade gasoline of 55 to 65 octane, kerosene, and distillate. Tractor No. 1 had a compression ratio of 4.2:1, and tractor No. 2 a compression ratio of 3.9:1. These were used in the laboratory tests.

In the laboratory tests both tractors developed their full rated power on all of the fuels. Maximum power of 41.81 hp. was developed with regular-grade

gasoline in tractor No. 1, with kerosene developing 40.57 hp., low-grade gasoline 39.94, premium-grade gasoline 39.50, and distillate 38.50 hp. Tractor No. 2 developed a maximum of 46.34 hp. on low-grade gasoline, 44.85 hp. with kerosene, 44.15 with distillate, 42.26 with regular-grade gasoline, and 41.98 hp. with premium-grade gasoline.

The specific fuel consumption in pounds per horsepower-hour was slightly higher with kerosene and distillate than with the other fuels, probably due to a lower heat content per pound and the greater difficulty of obtaining complete combustion. Fuel consumption by volume was consistently lower with the low-grade fuels. While the B. t. u. per pound of the gasolines was slightly higher and the specific fuel consumption lower with the gasolines, the greater weight per gallon of the low-grade fuels and their greater heat content per gallon resulted in economies in favor of kerosene and distillate in the low-compression engines tested. This saving in both tractors was approximately 0.25 gal. per hour over a wide range of loads.

Fuel costs were about 40 percent less with distillate than where a regular grade of gasoline was used. In general, the gasolines were more convenient to use, and the odors and fumes from the exhaust were less offensive.

A carburetor setting of from 30° to 60° greater opening was required for kerosene and distillate than for the gasolines. Operation of the tractor engines was erratic on loads of one-half or less of the rated power when burning kerosene and distillate. Raising the radiator curtains to maintain the cooling water at temperatures of from 190° to 210° F. partly corrected this difficulty. At quarter and half loads it was necessary to use the radiator curtain with room temperatures as high as 80° to maintain engine temperatures sufficiently high to handle the low-grade fuels.

Water was used as an antidetonant whenever detonation was severe enough to cause power loss. In one case only (tractor No. 2, maximum load, low-grade gasoline) was it necessary to use water with any of the gasolines. It was required when operating on kerosene and distillate for all loads above one-half load, and a small quantity was used with kerosene at one-half load with tractor No. 1.

A general-purpose tractor equipped with rubber tires was used in the field plowing tests using a two-bottom, 14-in. plow. In these tests there was slight detonation when huring kerosene, and less was used per acre than of the other fuels. These results were verified by numerous check runs, and in other tests it has been shown that lower fuel consumption will be obtained with low-grade fuels when a slight detonation occurs.

On a gallon-per-acre basis for this low-compression tractor the advantage was with the low-grade fuels, largely due to their greater weight and lower price per gallon. The fuel cost per acre for plowing was 55 percent lower with distillate than with premium-grade gasoline, 46 percent lower than with regular-grade gasoline, and 35 percent lower than with third-grade gasoline.

1936 tractor costs in Michigan, H. B. Taylor (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 76–79*).—Data are reported on yearly and hourly costs and on relation of hours of use to tractor costs and to farm-operating efficiency.

Labor, power, and machinery in corn production, C. K. Shedd, E. V. Collins, and J. B. Davidson (*Iowa Sta. Bul. 365 (1937), pp. 187–222, figs. 20*).—This bulletin reports the results of investigations conducted by the station in cooperation with the U. S. D. A. Bureau of Agricultural Engineering. It has been found in general that the operating costs in corn production depend greatly upon the efficiency of labor, power, and machinery management.

Raking and burning cornstalks before plowing in preparing a seedbed for corn required 0.47 man-hr. of labor and 0.38 tractor-hr. of power per acre and

appeared to be largely a waste of labor and power. Cutting stalks with a stalk cutter before plowing required 0.23 hr. per acre for man and tractor with no apparent benefit. Disking before plowing took 0.25 hr. per acre for man and tractor and seemed to be of doubtful value. With a plow that was designed and adjusted to cover trash, previous work on cornstalks was eliminated.

For the primary operation in preparing a seedbed for corn, the substitution of cheaper operations instead of plowing gave unsatisfactory results. Under favorable conditions, no measurable difference was found in the value of work done by the ordinary moldboard plow and the pulverator plow (one having rotating blades to pulverize the furrow slice as it is turned). Under very wet or very dry conditions the pulverator had some advantage.

For secondary operations in seedbed preparation, disk harrow and duckfoot field cultivators showed no difference in weed control or yield of corn.

The lever type of spike-tooth harrow was found preferable, under most conditions, to other machines tried for light operations in seedbed preparation. Drill planting was a faster operation than check planting, but weed growth was somewhat more effectively controlled in check-planted corn. Under ordinary soil conditions at planting time surface planting excelled the use of disk furrow openers. In a comparison of 42- by 42-in., 30- by 30-in., and 21- by 21-in. check planting, it was found mechanically feasible to plant and cultivate in the narrow spacings but the cost was a little higher than with standard spacing. Narrow spacing and single-plant hills produced a material increase in yield over that obtained by the usual method of check planting under favorable growing conditions in 1935, but there was little if any increase under adverse conditions in 1934 and 1936. For early cultivation of surface-planted corn a cultivator equipped with a pair of rotary hoe wheels near the row and six sweeps between rows gave the best results. Work done by spike-tooth harrow, weeder, and rotary hoe was not entirely satisfactory under some conditions. For cultivation of weedy corn the best results were obtained with a cultivator equipped with two pairs of disk hillers and one pair of sweeps per row. In the 3 yr., 1934–36, surface-planted corn yielded higher than listed corn, with little difference in yield between listed and basin listed corn. In basin listed corn, seed drilled in a continuous row without any synchronization with location of dams did as well as any other placement of seed.

Harvesting a 70-bu. yield of corn by machine required 9 man-hr. of labor per acre. Timeliness tests of corn picker-huskers showed that the best period for harvesting began as soon as the corn was dry enough to crib and in 2 out of 3 yr. ended the second week in November. Records of performance tests of corn picker-huskers are shown in detail. The amount of corn left in the field by these machines is probably the greatest obstacle to their universal use. With a high yield twice as much labor was involved in hauling and cribbing the corn as in picking with a two-row machine; therefore, the equipment for hauling and cribbing should receive careful attention. Under some conditions corn may be harvested economically by a machine and one-man crew.

Nursery root pruner for use in light soils, W. F. McCulloch (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 92, 93, fig. 1*).—This equipment as developed by the station is briefly described and illustrated.

Feed grinding, mixing, and elevating, H. N. Colby (*Washington Sta. Pop. Bul. 151 (1937), pp. 28, figs. 18*).—This report has been prepared in cooperation with the Washington Committee on the Relation of Electricity to Agriculture. It gives practical information on the mixing, grinding, and elevating of feeds, using electricity as the source of power.

Corrosion tests of metals and alloys in spray mixtures, E. M. Dieffenbach (*Agr. Engin., 18 (1937), No. 7, pp. 301, 302, figs. 2*).—Tests conducted by the U. S. D. A. Bureau of Agricultural Engineering are briefly reported.

It was found that aluminum, whether 99 percent pure or containing 4 percent copper, is very resistant to lime-sulfur solution and fully resistant to bordeaux mixture. Brass and bronze with a copper content up to 85 percent were found to be fairly resistant to both bordeaux mixture and lime-sulfur solution, but a bronze with a copper content of 95 percent was not resistant to lime-sulfur solution. Pure copper was fully resistant to bordeaux mixture but was not resistant to lime-sulfur solution. The copper alloys tested were also fully resistant to bordeaux, and the alloy consisting of copper approximately 74, nickel 20, and zinc 6 percent was fully resistant to lime-sulfur, but the one of copper approximately 96, silicon 3, and manganese 1 percent was not resistant to lime-sulfur. A copper-bearing iron with 0.15 percent or more copper content was fully resistant to bordeaux mixture but was not resistant to lime-sulfur. The three samples of nickel and nickel alloys tested were fully resistant to both bordeaux mixture and to lime-sulfur solution. Their slight gain in weight in some instances was probably due to the inadequacy of the cleaning solution used previous to the weighing. All stainless iron and steel tested was fully resistant to both bordeaux mixture and to lime-sulfur solution. Not only the alloy containing from 16 to 20 percent chromium and from 7 to 10 percent nickel was fully resistant, but also those with from 12 to 18 percent of chromium in the absence of nickel. Ordinary steel spray gun disks taken from stock were uot resistant to either bordeaux or to lime-sulfur. Pure tin was resistant to bordeaux mixture, but not to lime-sulfur solution. Pure zinc was not resistant to bordeaux mixture, but was fairly resistant to lime-sulfur. Similarly, commercial galvanized iron was not resistant to bordeaux.

Improvement handbook (*U. S. Dept. Agr., Forest Serv., 1937, pp. XX+446, figs. 126*).—The purpose of this handbook is to make available the methods and standards recognized as good practice in building structural improvements on the national forests. It contains chapters on preliminary planning for building developments; construction schedule and work plan; excavation; footings and foundations; piling and pile driving; wood preservation; protection against wood-destroying organisms; selection and use of wood products; millwork; light building construction; heavy timber construction; scaffolds and towers; log construction; concrete construction; building materials—selection and use; masonry and brick construction; steel erection; rigging; roofing materials; laths, plaster, and stucco; heating; electric service; plumbing; hardware; and painting and finishing work.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Alabama Station, 1936] (*Alabama Sta. Rpt. 1936, pp. 7–9*).—A table by B. T. Inman shows the quantities and retail values of different commercial feeds sold in the State in 1935. Some data are given as to changes in the State's production of hay crops from 1929 to 1935 and in corn production from 1889 to 1936. Another table by B. F. Alvord shows the relation in 1935 of the following factors to the labor income of 105 white farm operators in the Dadeville erosion control area: Percentage crop area in cotton, productive animal units per crop acreage, percentage cash receipts from livestock, crop acres operated, acreage of cotton, operator's investment, yield of cotton lint per acre, pounds of fertilizer used per acre of cotton, acres of cotton per plow, and value of farm produce used in the home.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 190 (1938), pp. 23–25*).—A table by F. L. Morison shows by years 1929–36 the gross cash income in Ohio from different crops, different kinds of livestock and livestock products, and Government payments. The percentages of total income (8-yr. average) for the several products are also given. The table of index numbers by J. I. Falconer (E. S. R., 78, p. 546) is brought down through October 1937.

[Investigations in agricultural economics by the Wisconsin Station, 1936–37] (*Wisconsin Sta. Bul. 439 (1937), pp. 27–35, figs. 2*).—A chart by D. R. Mitchell and D. Anderson based on a study of one township in each of four counties shows the changes from 1935 to 1936 in the acreages in soil-conserving crops on farms having different percentages of the crop land in such crops in 1935. Some findings of Anderson and W. Ebling in Emmet township, Dodge County, as to the effect of size of farm on production of farm commodities are included. Some findings of Anderson and P. E. McNall as to the relation of taxes and income for 611 farms in 1936 are also given. The differences in income in 1935 on the 20 least and 20 most successful farms of 100 farms in Emmet township, studied by Mitchell and Anderson, are shown, and some of the reasons for the differences are discussed. A chart by R. K. Froker in cooperation with J. G. Knapp, of the Federal Farm Credit Administration, compares the average gross margin, operating expense, net income, and volume of business of cooperative petroleum, warehouse, general stores, and combination associations operating in the State in 1934. A table by H. H. Bakken is included showing by years 1934–36 the average costs by items per ton of beets and hundredweight of sugar of marketing beet sugar for three companies. A brief note is included on a study by A. Hobson and M. A. Schaars of sales practices of retail stores likely to be most effective in promoting the consumption of cheese. Some information secured by A. W. Colebank and Froker and A. C. Hoffman, of the U. S. Department of Agriculture, as to the number and size of dairy plants in Wisconsin operated by different types of proprietors is given.

Shall we move to the country? R. C. Ross, R. R. Hudelson, F. C. Bauer, H. H. Alp, W. B. Nevens, and J. W. Lloyd (*Illinois Sta. Circ. 479 (1937), pp. 32, figs. 8*).—This is "a statement of the opportunities and problems met in acquiring and managing a small farm."

The opportunities on small farms, the limitations of such farms, personal requirements for success, capital requirements, sources of credit, choosing a farm, and the production of the family food supply and commercial production on small farms are discussed.

Agricultural outlook for Illinois, 1938 (*Illinois Sta. Circ. 480 (1937), pp. 32, figs. 14*).—"The Illinois agricultural outlook for 1938 is intended to supply information which will enable farmers to plan more intelligently their farming and marketing operations for the coming year. The information given is based on present available knowledge concerning State, national, and world-wide agricultural and economic conditions—the present and probable future supplies of farm products, and the present and probable demand for these products and for the commodities farm people buy." It was prepared in cooperation with the extension service of the college of agriculture of the University of Illinois and is based largely on data prepared by the U. S. Department of Agriculture.

A study of labor income on farms in the Dadeville Erosion Control Area, B. F. Alvord and J. A. Kyser (*Alabama Sta. Rpt. 1934–35, pp. 7–9*).—Farm management records for the year 1933 were obtained from 552 farmers. Tables show for white and colored farmers the average operator's labor income by

tenure groups and the relation of value of farm produce used in the home to available cash and operator's labor income. Findings are also included as to the relations between operator's labor income and size of farm, percentage of crop acreage in cotton, and cotton yields.

An economic study of farming in Appomattox County, Virginia, W. L. Gibson, Jr. (*Virginia Sta. Bul. 311 (1937), pp. 47, fig. 1*).—This analysis is based on 127 farm business records for 1935 obtained by the survey method. "This record consisted of an itemized list of all receipts and expenses, crop and livestock production and sales, inventory of property on hand at the beginning and the end of the year, other sources of income, and other information necessary for rendering a complete financial statement and making an analysis of the farm business." The economic conditions in the county during 1935 and the climate, topography, soils, transportation, etc., of the area are described.

The average size of the farms was 224.7 acres, of which over 50 percent was in woods. There was an average of 11.4 acres of idle cropland. The average capital was $7,833, of which 82.5 percent was in real estate. Sale of crops constituted 61.2 percent of all receipts. Sale of dark fire-cured tobacco constituted 82.7 percent of all cash crop sales. Of the total expenses, 53.7 percent was for labor, unpaid family labor constituting 47.3 percent of the labor expense, exclusive of operator. Crop expenses were about 20 percent of the farm expenses, fertilizer and lime being the most important items. Taxes amounted to about 5 percent of the total farm expenses. The average expenses per farm were $771, or 73.8 percent of the average receipts. The average labor income was —$131. Size of business showed little relation to labor income. Farm income increased as size of business increased but not sufficiently to offset the large and rapidly increasing interest allowance on capital invested. As days of productive work per man increased, labor income increased. Higher rates of production resulted in consistent increases in labor income. Farmers cooperating with the Soil Conservation Service operated larger than average businesses, received better crop yields, had better balance of business, and were above the average in the amount of productive work accomplished per man.

"The data indicate that a good balance would result from a business organization providing for 15 to 25 percent of the total receipts from livestock, 35 to 45 percent of the total receipts from tobacco, and 10 to 20 percent of the total receipts from other crops such as small grains, hay seed, and, in a few cases, vegetable crops."

An economic study of cattle business on a southwestern semidesert range, M. J. Culley (*U. S. Dept. Agr. Circ. 448 (1937), pp. 24, figs. 4*).—The findings in the study made from 1924 to 1934 by the Forest Service, in cooperation with the University of Arizona on the Santa Rita experimental range in southern Arizona, are reported. The study included 6,000 acres of range and an average of 218 breeding cows for the period 1924–27 and 24,700 acres of range and an average of 494 cows for the period 1928–34. The conditions as to climate, forage plants, grazing conditions, etc., on the range are described.

Gross returns per cow ranged from $13.56 to $49.27 in the different years, averaging $26.44. Total costs per cow ranged from $10.20 to $34.56, averaging $20.81. The amount received by operators for their labor and management ranged from —$2.96 to $14.92 per cow, averaging $5.63 or 8.13 percent on the average total investment of $69.23 per cow (exclusive of interest on operator's money). The yearly costs to produce an 8- or 9-month-old calf ranged from $12.86 to $41.20, averaging $25.11. Cattle losses averaged 2.8 percent per annum. The calf crop average was 82.7 percent. An average calf crop of 44 percent was required to meet cash expenditures and one of 56 percent for a

profit. Among the range practices materially increasing herd earnings were "stocking on the basis of sustained yield; regular fall-winter sales of high-grade calves; reduction of carry-overs, horses, and aged steers to the minimum; and leaving an equivalent of at least 15 percent of the forage as a drought safety factor. Recent findings have shown that 20-percent reserve would be better."

Production of crops and livestock on the Newlands project, 1912 to 1936, F. B. Headley (*Nevada Sta. Bul. 146 (1937), pp. 27, figs. 11*).—Tables and charts are included showing by years for the Newlands project of the U. S. Bureau of Reclamation the areas irrigable, irrigated, and cultivated; yields per acre and production of alfalfa, wheat and barley, potatoes, and other crops, 1912–36, and cantaloupes 1921–36; the numbers of dairy cows and bulls and number of beef cattle, 1922–36; sales of butterfat, 1932–36; numbers and average Nevada prices of swine, sheep and lambs (also prices of wool), turkeys, and horses and mules, 1914–36; number of chickens and average prices, 1921–36; population on farms, 1914–36; numbers of owners, tenants, and owner-tenants, 1930–36; and other data regarding the agricultural development of the project. The several tables and the agricultural development of the project during the period are discussed.

Farm prices and costs in Michigan, O. Ulrey (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 98–113, figs. 4*).—The purpose of this article is to bring the bulletin previously noted (E. S. R., 72, p. 124) up to date, to make corrections and additions to the indexes therein, and describe briefly the changes in the farm price situation since 1929. The tables in the earlier bulletin are brought down through 1936 for the yearly indexes and through September 1937 for the monthly indexes.

1936 dairy costs in Michigan, K. T. Wright and A. C. Baltzer (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 68–72*).—This article presents some of the findings in the fifth and final year of the study on dairy costs, using data obtained from 123 herds in the Dairy Herd Improvement Association.

The average net return for the 123 herds was $234, being $18.10 per cow, 22 ct. per 100 lb. of milk, and 5.2 ct. per pound of butterfat. The cost per pound of butterfat averaged 55 ct. on the farms averaging less than 250 lb. per cow and 41 ct. on those averaging over 400 lb. Returns per hour of labor increased from 29 ct. for the herds averaging 221 lb. of butterfat per cow to 63 ct. for those averaging 431 lb. The feed costs per pound of butterfat averaged 11 ct. in the 25 low-cost herds as compared with 20 ct. in the 25 high-cost herds. The low-cost herds were fed 487 lb. less concentrates, 1,100 lb. less hay, and 1,600 lb. less silage, but produced 336 lb. of butterfat as compared with 342 lb. for the high-cost herds. The return per hour of labor was 72 ct. in the herds where an average of 107 hr. were spent per cow, 46 ct. where 149 hr. were spent, and 34 ct. where 186 hr. were spent. The labor costs per pound of butterfat were under 9 ct., from 9 to 12 ct., and 12 ct. and over, respectively. All items of expense other than feed and management averaged $94 per cow in the "small" herds (9 herds averaging 6 cows) and $70 in the "large" herds (19 cows or more and averaging 23 cows). Net return per cow was highest in herds of from 10 to 16 cows. The dairymen using milking machines used 28 hr. less of labor per cow in herds under 10 cows, 45 hr. less in herds of from 10 to 16 cows, and 16 hr. less in herds of over 16 cows. The savings in time cost approximately 14 ct. an hour in the small herds, 5 ct. in the medium size herds, and 13 ct. in the large herds.

Costs and profits from apple production in New Jersey, A. G. Waller and J. W. Carncross (*N. J. State Hort. Soc. News, 18 (1937), No. 4, pp. 919, 928*).—A table shows the average returns above cost per acre, number of times sprayed

and costs of spray material per acre, pounds of fertilizer and cost per acre, and cost of cover crops per acre on 60 farms in Burlington, Monmouth, Cumberland, and Gloucester Counties, N. J., in 1934, grouped on the basis of whether yield per acre was under 100 bu., from 100 to 199, or 200 bu. or over. Another table shows the average cost per application of applying spray materials in 24 of the orchards.

Analysis of the livestock price situation in Ohio, G. F. Henning and E. B. Poling (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 101 (1937), pp. [2]+24, figs. 24*).—This bulletin brings the study previously noted (E. S. R., 76, p. 263) up to June 1, 1937, and in addition includes data for the Columbus and Cleveland markets for the years 1932–36. Prices on identical days each week obtained at the Cincinnati, Dayton, Columbus, and Cleveland markets for hogs of different weights, calves, and lambs are averaged by months and compared. Cincinnati prices are compared with Chicago prices. Prices at the farm in different sections of Ohio and Ohio farm prices and prices in other selected States are also compared.

Wool prices: Comparative prices and price differentials on domestic and foreign wools, together with a comprehensive glossary of wool terms (*U. S. Tariff Comn. Rpt. 120, 2. ser. (1937), pp. V+54, fig. 1*).—This is a study of the effect of the United States tariff on the price of raw wool. Prices for the four main grades of domestic wool quoted on the Boston market, 1924–35, are compared with prices for similar foreign wools recorded at the London wool auctions. A number of factors apart from the duty which prevent import parity are discussed. Appendixes include statistics of United States production, imports, and consumption of wool and comparative wool prices and price differentials on the Boston and London markets and a glossary of wool terms.

Crops and markets, [December 1937 and January 1938] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), No. 12, pp. 253–320, figs. 5; 15 (1938), No. 1, pp. 1–16, fig. 1*).—Included in each report are the crop and livestock production and market reports of the usual types. No. 12 includes an article on Cash Farm Income in 1937 (pp. 256–258), with a chart showing for 1924–37 the index numbers of national income, exclusive of agriculture and the contribution of agriculture to the national income; a map and table showing by States the cash income, 1937, from 78 crops, 13 livestock items, and Government payments; and a table showing the cash farm income by years 1924–35 from selected crops, all crops, livestock, and Government payments. Statistics of important crops by States are also included in No. 12 as to acreages harvested, yields, production, and cash income in 1937, with comparisons with 1936, and the averages for the period 1928–32.

Agricultural markets, J. H. Frederick (*New York: Prentice-Hall, 1937, pp. XIII+289, figs. 72*).—This book is a description of the leading organized agricultural markets of the United States, "designed as a text particularly for the student of agricultural marketing who, because of the differences between individual agricultural markets, feels the need for a more detailed description than is found in most works on the general subject of marketing. The author believes that students are best able to grasp the meaning and importance of the marketing functions, or major specialized activities performed in marketing, when they see them applied to actual products and conditions. No attempt is made in this volume to evaluate or describe the changing government activities in connection with the control and distribution of agricultural products. Rather, the attempt is made to deal with the strategy, tactics, and technic of the long-established markets for agricultural products and to show the workings which must take place with or without artificial price stimulations, price restrictions, and the like."

The several chapters deal with general aspects of agricultural markets; cooperative marketing of agricultural products; standardization of farm products; organized speculation and the marketing of agricultural products; the country and terminal grain markets; the country, central, spinners, export, and future markets for cotton; the tobacco and livestock markets; direct marketing of fruits and vegetables; the country and city fruit and vegetable markets; the milk market; and the poultry and egg market.

Eggs under the hammer, L. A. Dougherty *(New Hampshire Sta. Bul. 300 (1937), pp. 48, figs. 21)*.—This study deals with the marketing of New Hampshire eggs, with special reference to the auction method of sales. Its principal purpose was "to determine the relationship between different qualities, weights, and methods of handling eggs and the prices received for them." A study was also made of the importance the auction method was assuming, to what extent its methods needed to be modified, and to what extent it would influence other methods of sale. Data regarding auction sales were obtained from the records of the New Hampshire Egg Auction opened at Derry in June 1934, and those regarding sales to and by retail stores from the reports and records of the State Department of Agriculture. Records from producers selling to Boston dealers were also obtained. The daily reports of the Boston Fruit and Produce Exchange were the source of Boston wholesale quotations. The organization and operation of the egg auction and related topics are briefly discussed.

The active membership of the New Hampshire Egg Auction increased from 42 in June 1934 to 594 in December 1936. The net charges per case were reduced from 50 to 40 ct. In 1935 about 22 percent of the members of the auction shipped every month. One-fourth of the shippers sold 100 cases or more through the auction in 1935–36, and their sales made up two-thirds of the volume handled by the auction. About 70 percent of the sales by auction were at the semiweekly auction sales and about 30 percent between sales. The most common gross weight per case was 60 lb. About 63 percent of the eggs sold at the auction were large eggs, 23 percent mediums, and 10 percent pullet eggs. Old members whose numbers are well known had a slight advantage over new members in prices received. The first large eggs sold at an auction sale had a very small price advantage. About 60 percent of the buyers who attended auction sales were peddlers who bought about 40 percent of the eggs sold. Auction prices of New Hampshire Special Grade Large Brown eggs exceeded Boston wholesale quotations on Near-by Specials in about 80 percent of the sales. The premiums were highest in August and September. Brown eggs brought on an average 1.5 ct. per dozen more than white eggs of the same grade. Heavy weight large brown eggs brought more per dozen but less per pound than light weight large eggs. Price per pound of eggs usually increased sharply between official sizes, but usually decreased as weight increased within a given size. Special Grade Large Brown eggs brought an average premium of about 2 ct. per dozen over Extras. The average margin in 1935–36 on eggs sold in retail stores was about 6.2 ct. per dozen.

Western cream for eastern markets, L. Spencer *(Farm Credit Admin. [U. S.], Coop. Div., Misc. Rpt. 14 (1937), pp. [2]+16, fig. 1)*.—This preliminary report of a study made in 1936 in cooperation with Cornell University discusses the volume, sources, seasonal distribution of shipments of cream from western stations to markets of the Northeastern States, types and control of western cream plants, potential shipments of cream from such plants, prices received by western producers for cream, freight costs, etc.

The Florida winter-vegetable industry and the trade agreement with Cuba *(U. S. Dept. Agr., Bur. Agr. Econ., F. S. 70 (1937), pp. [2]+57, figs. 6)*.—"On September 3, 1934, a reciprocal trade agreement was concluded with Cuba in which the United States made seasonal reductions in its import duties on

eight fresh vegetables coming from that country—tomatoes, potatoes, peppers, lima beans, okra, cucumbers, squash, and eggplant." The reductions were 25 percent on tomatoes, peppers, and squash and 50 percent on the other vegetables.

This report covers the six more important Florida vegetables—tomatoes, green beans, potatoes, peppers, cucumbers, and eggplant—and includes information as to commercial acreages planted and harvested, yields and production, farm prices, farm income, and the comparative periods and volume of shipments from Florida and from Cuba during the three seasons preceding and the three seasons following the agreement. Where possible, the data are broken down to show the situation in southern Florida as well as in the State as a whole.

Carlot shipments and imports of winter vegetables, 1931–32 to 1936–37 (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 70 (1937), Sup., pp. [2]+36*).—This report supplements the preceding report. Tables show by months, November–June 1931–32 to 1936–37, the shipments by rail by counties from Florida, shipments by boat from Florida, shipments from Texas, Puerto Rico, and other States, and the imports from Cuba, Mexico, and other countries of fresh green beans, cucumbers, eggplant, green peppers, and tomatoes, and new potatoes.

An economic study of some problems of western Illinois apple growers, H. W. MUMFORD, JR., and S. W. DECKER (*Farm Credit Admin. [U. S.], Coop. Div., Misc. Rpt. 13 (1937), pp. [2]+85, figs. 3*).—This is a study made in 1936 in cooperation with the Illinois Experiment Station on the present status and needs of the apple industry in Adams, Brown, Calhoun, Greene, Jersey, Pike, and Scott Counties. Information was obtained from 313 growers, as well as from commission men, brokers and other marketing agencies, concerns making cider, vinegar, pies and other apple products, cold-storage house operators, trucker-dealers, bankers and businessmen, growers' organizations, farm advisers, etc. The development and stability of the orchard industry and the economic situation of the area are discussed. Current production, market practices, packing and storage facilities, financing practices, etc., are discussed and recommendations made, especial consideration being given to the possibilities for cooperative organization.

Marketing policies of the California Walnut Growers Association, H. C. HENSLEY and N. H. BORDEN (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 10 (1937), pp. IV+116, figs. 29*).—This is "a study appraising the methods used to increase the demand for walnuts, with emphasis placed on the value and effectiveness of the advertising, sales promotion, price policies, and distribution channels employed by the California Walnut Growers Association."

The Lake Shore Growers' Cooperative Auction, Inc.: An analysis of its 1936 operations, C. W. HAUCK (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 99 (1937), pp. [3]+22+[17], figs. 6*).—This analysis of the 1936 operations of the Lake Shore Growers' Cooperative Auction, organized in August 1936, includes data as to method of operation, membership, financing, charges, sales, prices, etc.

Minnesota cooperative creameries, E. F. KOLLER and O. B. JESNESS (*Minnesota Sta. Bul. 333 (1937), pp. 82, figs. 13*).—"The purpose of this study was to ascertain the present status of the organization and operations of Minnesota's cooperative creameries in order to find what adjustments they have made to the new trends and developments in the industry." Particular emphasis is placed on the analysis of the factors affecting the efficiency of cooperative creameries. Visits were made to 175 cooperative creameries, the main function of which was the manufacture of butter, and copies of balance sheets and operating statements for the year ended December 31, 1934, were obtained from most of the associations. This material was supplemented by accounting and

statistical reports made monthly and annually to the Minnesota Department of Agriculture. The data are analyzed and discussed under the general headings of organization structure and cooperative character, financing, patronage and butterfat supply, measures of creamery efficiency, manufacturing operations marketing operations, and relation of operating factors to butterfat returns.

The creameries studied manufactured an average of 353,000 lb. of butter annually, the output ranging from 45,000 to 1,668,000 lb. Virtually all of the associations conformed to such cooperative requirements as the one-man-one-vote principle and the limitation of dividends on capital stock. Only 78 showed that 90 percent or over of their members were producers, and Federal taxes were paid by 55 associations, indicating their failure to meet Federal tax requirements for cooperative associations.

Capital ranged from $4,000 to $85,000, averaging $26,000. Members and patrons provided an average of 87.2 percent of the capital. The presence of competing buyers, often from 3 to 7 within a 10-mile radius, prevented many creameries from utilizing their plants and personnel fully and resulted in higher costs per unit. Transportation developments are changing butterfat assembly methods and intensifying competition, and some creameries, by the use of trucks, may be able to increase their volume and reduce their plant costs sufficiently to offset the added assembly costs. Price paid for butterfat was the chief factor affecting patronage.

Total costs of manufacture in 173 of the creameries studied varied from 1.209 to 4.796 ct. per pound of butter made. Increases in volume up to 500,000 lb. were accompanied by relatively large decreases in cost. The fact that the largest creamery with an annual output of over 1,668,000 lb. of butter had the lowest per unit costs indicates that highly efficient operations can be attained in plants approaching a 2,000,000-lb. production. Average net prices for butter sold varied from 22.965 to 25.707 ct. per pound. Side-line sales constituted 8.8 percent of the total sales of the creameries. Most creameries used such earnings to improve butterfat prices. The net return per pound of butterfat handled varied from 23.97 to 29.935 ct., the usual return being from 26 to 26.5 ct. The creameries with better than average results in all or a majority of the principal factors affecting creamery efficiency had approximately 3.36 ct. more available per pound for butterfat payments than did those exceeding the average in only one or more of the factors.

"It may be concluded that the cooperative creamery has been an important factor in the improvement of agriculture in Minnesota. The cooperative has improved the returns of the butterfat producer by manufacturing a high-quality product which has commanded a premium on the market. At the same time the cooperative creamery has been a means for combating inefficiency in the manufacture of butter, thereby reducing the costs of operation and the margins retained on each pound of butterfat handled. Although cooperative creameries in general have achieved the purposes for which they were originally organized, there are indications that they are not adjusting their organizations and operations as readily as they should to important developments which the industry has experienced in recent years."

Financial operations of Ohio farmer owned elevators during the fiscal year 1936–37, B. A. Wallace (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 103 (1937), pp. [1]+20*).—This ninth number in the series previously noted (E. S. R., 76, p. 556) gives data for the fiscal year 1936–37. It is based on the main balance sheet and income and expense items from 150 companies operating 190 plants, detailed analysis of expense items from 52 companies, commodity sales and margins of 38 companies, and accounts receivable data for 20 companies.

Rural finance and cooperation, C. F. STRICKLAND (*Shanghai: Chung Hwa Book Co., [1937], pp. [4]+II+459*).—This is a series of lectures on rural finance and cooperation delivered at the University of Nanking. The lectures were preceded by a field survey of the cooperative work in a number of provinces of China. A translation of the Cooperative Society Law promulgated by the National Government of China, March 1, 1934, is included.

American cooperation, 1937 (*Washington, D. C.: Amer. Inst. Coop., 1937, pp. XIII+694, figs. [15]*).—This is a collection of papers presented at the thirteenth summer session of the American Institute of Cooperation, held at Ames, Iowa, June 21–25, 1937. It includes five general introductory papers and 78 papers on different phases of social-economic aspects of cooperation; agricultural cooperation in the national economy; education in cooperation; cooperative marketing of livestock, manufactured dairy products, fluid milk, grain, poultry and eggs, and wool; farmers' mutual insurance; and cooperative farm supply purchasing.

Mutual irrigation companies in California and Utah, W. A. HUTCHINS (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 8 (1936), pp. V+235, pl. 1, figs. 34*).—This bulletin is based on a study undertaken in 1935 in which detailed reports made in the form of completed questionnaires, with some supplementary data, were obtained by consultation with the officers of 36 companies in northern California, 48 in southern California, and 38 in Utah. The characteristics of the mutual type of organization and its importance are described. The organization structure; legal features; membership; capital structure; credit; management; operation and maintenance; accounting, records, and reports; and income and expenditures of mutual irrigation companies are discussed.

Relation of mass buying to mass selling, H. E. ERDMAN (*Jour. Marketing, 2 (1937), No. 1, pp. 13–20*).—The relationships between grocery chain stores and large farm cooperatives selling farm products, particularly as the results bear on the welfare of producers and consumers of farm products, are discussed. The author believes that "a frank recognition of mutual usefulness will serve best not only producer and consumer but the cooperative and chains as well."

Short-term loans to farmers by Michigan country banks, R. J. BURROUGHS and S. K. FRISBIE (*Michigan Sta. Quart. Bul., 20 (1937), No. 2, pp. 63–68*).—The purpose of and methods used in the study are described, and some preliminary findings regarding the loans of one Jackson County bank are included. A tabulation of the replies of 110 country banks to 9 questions regarding the quality of farm credit is also included.

Financing farm ownership through payment in kind, O. R. JOHNSON (*Southwest. Social Sci. Quart., 18 (1937), No. 2, pp. 136–144*).—The need for a land policy that will make it possible for farm laborers and tenants to acquire and retain ownership of farms and the plan for acquiring ownership by payment in kind, outlined in Bulletin 378 of the Missouri Experiment Station (E. S. R., 77, p. 118), are discussed.

Semi-annual index of farm real estate values in Ohio, January 1 to June 30, 1937, H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 102 (1937), pp. [5], fig. 1*).—This bulletin continues the series previously noted (E. S. R., 77, p. 872).

Some inequalities in the assessment of farm real estate in South Carolina, G. H. AULL and E. RILEY (*South Carolina Sta. Bul. 313 (1938), pp. 46, figs. 17*).—Through the cooperation of lending agencies, information was obtained with regard to the acreage, owner's estimate of value, normal market value, net returns from operation, etc., for 1,544 farms that had been appraised for loans during 1935 and 1936. Of the applicants for loans, 995 lived on their farms and

549 elsewhere. Information as to the acreages assessed, assessed value, and taxes paid was obtained for the same farms from county records.

The average ratio of assessed to normal market value as determined by experienced appraisers was 24.6 percent. The variations by counties and type-of-farming areas were not materially significant. The ratios tended to decrease as the average normal value increased, being 31.3 percent on farms appraised at less than $1,000, 28.7 percent for those appraised at from $1,000 to $2,000, and 18.8 percent for those appraised for $15,000 or more. The ratio decreased as the value per acre increased, the farms appraised at less than $20 per acre being assessed at 34.8 percent of the valuation as compared with 13 percent for the farms valued at $70 and more per acre. Except for farms of less than 25 acres, for which the ratio was 17.3 percent, there was little deviation from the average ratio in the farms grouped on the basis of size. Within each group, however, there were significant differences due to total value and value per acre.

Taxes equaled 13.85 percent of the estimated net returns (before deducting taxes) from the 1,544 farms. The range was from over 100 percent for farms reporting negative returns to less than 8 percent on those reporting a net return of $1,000 or more. Nearly one-third of the farms, including nearly two-fifths of the total value, was assessed at less than 20 percent of the appraised value, while one-third of the number, including one-fourth of the value, was assessed at 40 percent or more. The extreme assessments ranged from less than 5 percent to over 100 percent. The assessment ratios appeared to be somewhat more favorable to owners occupying their farms than to owners living elsewhere. In all the analyses the appraised values were approximately one-half as high as the estimates of value made by the owners.

Development of highway administration and finance in New York, W. M. Curtiss (*[New York] Cornell Sta. Bul. 680 (1937), pp. 63, figs. 4*).—New York highways in the colonial period, early Federal support for highways, privately owned highways, and town highways prior to 1890 are described. The development of the State highway system beginning with the Higbee-Armstrong Act in 1898 is described, and the highway act of 1908, the changes in the laws, the financing of State and county highways, and Federal aid are discussed. The review of highway administration in counties includes discussions of the legislation, the highway functions performed by counties, and the financing of such functions. The section on highway administration in towns since 1890 describes and discusses State aid for town highways, the administration of town highways, the relation of town administration to State and county highways, and highway receipts and expenditures in 876 towns in 1934. The sources of funds of the State, counties, towns, cities, and villages for highway purposes are also discussed. Appendixes include tables showing by years 1922–35 the expenditures by the State, counties, cities, towns, and villages for streets and highways; the mileage, January 1, 1937, by counties of State, county, and town highways; the mileages of improved and unimproved roads; and the mileages of city and village streets.

Proposed adjustments in the farm tenancy system in Missouri, J. H. Dickerson (*Missouri Sta. Res. Bul. 270 (1937), pp. 63, figs. 11*).—"The object of this study has . . . been to bring together in readily available form some of the most recent thinking in connection with this general problem of landlord-tenant relationships, and to quote from our own statutes the most pertinent legal provisions for dealing with this relationship. There is also presented some of the more obvious advantages and disadvantages connected with current proposals for improvement of the landlord-tenant situation, more particularly

those proposals embodied in the report of the President's committee." The growth and expansion of tenancy, the causes of present unsatisfactory conditions of tenure, and the effects of insecurity of tenure are described. The improvement of landlord-tenant relations are discussed under the headings of the need for improvement; recommendations of the President's Committee on Tenancy; agricultural leases shall be written; compensation for improvements and removal of severable fixtures; compensation for disturbance; notice for termination of tenancy; the tenant shall compensate the landlord for damage and the landlord shall be empowered to prevent continuance of wastage; boards of arbitration; limitations of landlord's lien; minimum housing and sanitary requirements; and research, education, and extension work.

Some references are made to the matter in which England has dealt with some of the landlord-tenant problems. The encouragement and stabilization of farm ownership is discussed under the headings of recommendations of the President's Committee on Tenancy, special tax on capital gains from short-term farm ownership, and tax exemption on limited holdings for homesteads. A bibliography is included. Appendixes include the sections of the revised statutes of Missouri, 1929, pertaining to landlord-tenant relationships discussed and chapter 9 of the *Agricultural Holdings Act, 1923, of the British Parliament* relating to agricultural holdings in England and Wales.

Farm tenancy and rental contracts in North Dakota, C. E. Miller and W. O. Brown (*North Dakota Sta. Bul. 289 (1937), pp. 27, figs. 10*).—A table shows by States the percentages of farms in the United States operated by tenants at each agricultural census, 1880–1935, inclusive. Other tables and maps show for the State by counties the percentages of farms operated by tenants at each census, the percentages of acreage rented operated under cash rent and different types of share rent contracts, the share renting arrangements on grain farms, and the contributions by landlords and tenants under different share and cash rent cotracts on 205 farms. The four generally accepted forms of farm rental in the Northwest are described, and the provisions under three forms of contracts used by the Northwest Farm Managers Association are discussed. A chart and table shows for 366 farmers in 25 counties of the State, the number of years of occupancy as of December 1936 of owners, part owners, tenants, and tenants who had formerly operated the farm as owners. Similar analysis as to owners, part owners, managers, and tenants is made for 83,460 of the 84,606 North Dakota farmers shown by the 1935 U. S. Census of Agriculture. An appendix includes a statement of 10 essentials of a satisfactory farm lease.

Migratory farm labor in the United States, P. S. Taylor (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 44 (1937), No. 3, pp. 537–549*).—This paper, presented before a joint meeting in 1936 of the American Farm Economic Association and the rural sociology section of the American Sociological Society, is based on research initiated by the California Relief Administration and continued by the U. S. Resettlement Administration and Social Security Board.

A study of farm layout in Indiana, E. C. Young and F. V. Smith (*Indiana Sta. Bul. 423 (1937), pp. 30, figs. 10*).—A study was made of detailed maps of 1,600 farms representing all types of farming in the State. The principal factors controlling farm layouts are described, and the farm layout and economy in crop growing, use of pasture and crop residues, economy in handling livestock, and fencing costs and problems are discussed.

The number of fields per farm increased from 6.7 for 80-acre farms to 11.1 for 240-acre farms and 13 for farms of 340 acres or more. The average size of fields was 11.7, 24.6, and 37.6 acres, respectively. Of the fields, 32 percent were

reached directly from the farmstead, 20 percent by lanes, 19 percent through pasture fields, 17 percent through crop fields, and 12 percent by public roads. The average distance to fields from the farmstead was 51.7 rods. Little relation was found between size of crop fields and economy of operation. The average labor income on farms making the smallest use of crop residues was $216, and that on the farms making the greatest use was $1,108. Where hogs are important, a layout making clean water available to a maximum number of fields is of primary importance. Investment in fences represents approximately 8 percent of the total value of the farm real estate of the State. The average cost of building woven wire fence in Indiana was $1.22, and the annual cost was 14 ct. per rod.

Land-use planning in relation to livestock production [in Nebraska], A. ANDERSON (*Nebr. State Bd. Agr. Ann. Rpt., 1936, pp. 655–668, figs. 4*).—The soil areas, problem areas, and type-of-farming areas of the State are described and recommendations made for changes in the cropping system of the State. A table shows the erosion conditions of the lands of the State as determined in a reconnaissance erosion survey of the U. S. D. A. Soil Conservation Service.

Under the cropping system in 1929, 43.8 percent of the acreage was in crops, 46.5 in pasture, and 6.2 percent in wild hay. It is recommended that changes be made to bring these percentages to 38.6, 51.6, and 6.2, respectively. The percentages of the total crop area in different crops in 1929 were corn 48.6, sorghum 0.7, wheat 18.9, oats 12.3, barley 3.3, rye 1.2, tame hay 7.8, and other crops (including failure and fallow) 6.5. The recommended percentages are 41.9, 4.6, 17.2, 8.7, 5.6, 3.3, 12.5, and 5.7, respectively. It is estimated that the changes would result in a decrease of slightly over 47,100,000 feed units from grains and increases of over 30,400,000 units from corn silage, sorghum forage, and tame and wild hay, and nearly 17,000,000 units from pasture.

Foreign Agriculture, [January–February 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2 (1938), Nos. 1, pp. 56; 2, pp. 57–116*).—The progress and results of agricultural aid programs during 1937 in the principal foreign countries are reviewed and appraised. No. 1 deals with the United Kingdom, Germany, France, Italy, and Japan, the principal countries importing agricultural products from the United States. No. 2 deals with the principal countries exporting agricultural products—Canada, Australia, Argentina, Brazil, the Netherlands, Denmark, Hungary, and the Union of Soviet Socialist Republics.

World wheat acreage, yields, and climates, M. K. BENNETT and H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 13 (1937), No. 6, pp. [2]+265–308, figs. 8, maps 3*).—The discussion deals broadly "first with World wheat acreage in relation to total land area, arable land, and acreage devoted to other crops; with its distribution by countries and political affiliations of countries; and with its distribution by levels of average yield, by rainfall zones, by latitude, and between and within climates. Yields per acre are then considered in relation to the various types of climate. Finally, the discussion deals with average post-war interrelationships between yield per acre, annual average precipitation, annual average temperature, preharvest precipitation, and preharvest temperature. Attention is here centered, first, on the meteorological values generally associated with the lower levels of wheat yield, and, second, on the meteorological values that may be termed 'optimum' for yields of wheat."

The World wheat situation, 1935–36: A review of the crop year, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 13 (1936), No. 4, pp. [2]+141–232, figs. 29*).—"Total wheat utilization again exceeded the year's production, and drafts upon stocks reduced the World carry-over ex-Russia to

the lowest point since 1928. . . . International trade in wheat and flour shrank below the low level of 1934–35, as import demand from the Orient fell off and that of Europe again disappointed expectations. . . . Prices of British import wheats averaged 14 percent higher than in 1934–35, reflecting the definite passing of a period of abundant supplies. Price advances were even larger in Argentina and Australia, but much smaller in the United States and Canada. In many countries prices were fixed or supported at levels stimulating further expansion of wheat acreage. In June–July 1936, however, adverse weather again led to sharp advances in open market prices, correctly presaging another short World crop."

World wheat survey and outlook [January and May, 1937], H. C. Farnsworth, M. K. Bennett, and H. Working (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 13 (1937), Nos. 5, pp. [2]+233–264, figs. 7; 8, pp. [2]+377–406, figs. 7*).—Data as for these two dates are reported in the respective numbers.

The timing of wheat marketing in western Canada, H. Working (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 13 (1936), No. 2, pp. [2]+33–64, figs. 12*).—"During August–January the amounts marketed weekly tend to be directly proportional to the total to be delivered during the season. The percentages delivered weekly depend chiefly on the weather and the stage of completion of deliveries. Widespread introduction of the combine advanced the start of rapid marketing by about 15 days and the '25 percent point' by nearly 3 weeks. After the end of January the rate of delivery in million bushels per week depends chiefly on the quantity which has been held back for deferred marketing, which has varied from 29 to 95 million bushels. . . . The tendency has been to market a definite proportion of this remainder each month. The proportional distribution of deferred deliveries among months has varied somewhat from year to year under the influence of contemporary price tendencies. Since 1928–29 there has been a marked trend toward longer postponement of such deliveries as have been delayed until after January."

Wheat problems and policies in Germany, N. Jasny (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 13 (1936), No. 3, pp. [2]+65–140, pl. 1, figs. 17*).—"In the present study an attempt is made to illuminate various wheat problems of Germany, within the background of her resources, recent history, and national policy, and specifically to appraise the possibility that Germany may resume her former position as a heavy net importer of wheat. This bears upon the prospects for revival of world trade in wheat. World economic recovery may help to undermine policies of self-sufficiency, but the outlook for substantial enlargement of German wheat imports is by no means promising. Increased net imports may well occur over the next decade, but probably in a degree representing only fractional restoration of the predepression level of imports."

Soviet agricultural reorganization and the bread-grain situation, V. P. Timoshenko (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 13 (1937), No. 7, pp. [2]+309–376*).—This study illuminates the course of agricultural developments in the U. S. S. R. since 1930 and 1931, when Soviet grain exports reached spectacular heights after a bumper crop.

Cotton production in British East Africa, P. K. Norris (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 73 (1937), pp. [2]+23, fig. 1*).—This is a revision of the article previously noted (E. S. R., 78, p. 118). The area and population; history, present importance, and trends of cotton production; areas available for cotton; climate; soils; insects and diseases; costs of production; marketing; government policy; outlook; etc., are discussed.

Consumption and production of tobacco in Europe, J. B. Hutson (*U. S. Dept. Agr., Tech. Bul. 587 (1937), pp. 115, figs. 19*).—"Changes that took place from 1913 to 1932 in the consumption of leaf tobacco and tobacco products are shown in this bulletin, and attention is directed to the more significant causes. Consumer preferences, prices, and trade restrictions loom large. The types of tobacco grown in Europe are described, the producing areas are located, and the approximate production of each type is indicated. Cases in which production has been influenced by trade restrictions or other forms of government influence are noted. The changes that have taken place in each country in the production of leaf tobacco, in the consumption and prices of tobacco products, and in the origin of import leaf are traced."

The tobacco market in the British Isles, P. G. Minneman (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 72 (1937), pp. [2]+36, figs. 6*).—The consumption, leaf requirements, source of leaf supply, effects of general government policy, and the effects of the preferential tariff policy in the United Kingdom; the production in Empire countries; and the consumption, source of supply, and government policy of the Irish Free State are analyzed and discussed. The outlook for exports of tobacco from the United States to the British Isles and the Irish Free State is summed up briefly.

The dairy industry in Canada, J. A. Ruddick, W. M. Drummond, R. E. English, and J. E. Lattimer, edited by H. A. Innis (*Toronto: Ryerson Press, 1937, pp. XXXII+299*).—"This volume has been arranged (1) to describe the background of the industry in relation to world trade in general and trade with the United States in particular; (2) to give a general survey of the dairy industry as seen through the eyes of one who has been directly concerned with its development; (3) to describe its problems generally and in relation to a specific region; and (4) to suggest the effects of tariff policy." The part on historical background was contributed by H. A. Innis, that on the development of the dairy industry in Canada by J. A. Ruddick, that on problems of the Canadian dairy industry by W. M. Drummond, that on problems of a specialized area—the Fraser Valley by R. E. English, and that on American tariff policy and the Canadian dairy industry by J. E. Lattimer and H. A. Innis. A note on the dairy industry in the Maritime Provinces, by S. A. Saunders, is also included.

A survey of the agricultural trade between the United States and Canada, 1935 to 1937 (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 69 (1937), pp. [2]+20*).—A series of tables shows the development of trade between the United States and Canada, particularly in respect to agricultural products for the calendar years 1935 and 1936 and the first quarters of 1936 and 1937. "The information is of interest in connection with the trade agreement between the two countries, which has been in effect since January 1, 1936." Some data are also included in regard to imports of cattle into the United States from Mexico. "Exports of agricultural and nonagricultural products from the United States to Canada increased in 1936 over 1935 in about the same proportion, although in both years the value of exports of nonagricultural products was between six and seven times larger than the value of exports of agricultural products. Exports of American agricultural products on which Canada reduced import charges made a percentage increase in 1936 over 1935 about four times as large as the increase in exports of items upon which no reductions were granted. Imports of Canadian agricultural products into the United States in 1936 increased to a relatively greater extent than did imports of nonagricultural products. Imports into the United States of agricultural items on which the United States granted duty reductions increased substantially more than did imports of other agricultural products. The total value in 1936 of exports of

American agricultural products on which Canada made reductions in charges was slightly larger than the value of imports of Canadian agricultural products on which the United States granted reduced duties."

International trade in meat, A. Brizi (*Internatl. Inst. Agr. [Roma], Studies Princ. Agr. Prod. World Market, No. 2 (1936), pp. XI+424, figs. 11*).—This second volume of the series previously noted (E. S. R., 78, p. 119) deals with cattle, pigs, and sheep, and meat derived from such animals. It applies primarily to the period 1924–35, with some data included for earlier years for the purposes of comparison. For each kind of animal a general survey is made of the international trade, followed by a study of the movement and the structure of foreign trade in meat as affecting the importing countries that exercise a decisive influence on it. In the case of swine, the development of foreign trade of Denmark and the United States is also discussed. A chapter deals with the production, consumption, and volume of imports of meat in the principal European countries importing meat since the World War. A final chapter summarizes the observations and sets forth the conclusions drawn regarding future developments. Appendixes (pp. 339–424) include tables relating to the international trade in animals and meat and the import duties on slaughter animals and meat in the principal importing countries.

The first world agricultural census (*Internatl. Inst. Agr. [Roma], First World Agr. Census Buls. 8 (1936), pp. XXXVI+179; 12 (1936), pp. 72; 13 (1936), pp. 107; 14 (1936), pp. 41; 15 (1936), pp. 19; 17 (1937), pp. 43; 19 (1936), pp. 30; 20 (1937), pp. 79; 21 (1937), pp. 62; 23 (1936), pp. 27; 24 (1936), pp. 35; 25 (1937), pp. 48; 31 (1936), pp. 15; 32 (1937), pp. 27; 34 (1937), pp. 37*).—These bulletins continue the series previously noted (E. S. R., 76, p. 557). No. 8 presents data for the United States of America, No. 12 for the outlying territories and possessions of the United States, No. 13 for Austria, No. 14 for Belgium, No. 15 for Denmark, No. 17 for French West Africa, No. 19 for Sweden, No. 20 for Switzerland, No. 21 for Algeria, No. 23 for Greece, No. 24 for Norway, No. 25 for Mozambique, No. 31 for the Netherlands, No. 32 for Spain, and No. 34 for Egypt. Nos. 21 and 25 are in French.

International yearbook of agricultural legislation, 1936 [trans. title] (*Inst. Internatl. Agr. (Roma], Ann. Internatl. Lég. Agr., 26 (1936), pp. XXXVI+1030*).—This volume continues the series previously noted (E. S. R., 76, p. 264).

RURAL SOCIOLOGY

[Investigations in rural sociology by the Wisconsin Station, 1936–37] (*Wisconsin Sta. Bul. 439 (1937), pp. 36–39, fig. 1*).—Comparisons of incomes, standards of living, and types of farming in the central Wisconsin purchase area (an area in which the U. S. D. A. Resettlement Administration has been purchasing submarginal lands) and the resettlement area (an area in which the Administration is assisting people to begin farming) are made, based on a study of J. H. Kolb and G. W. Hill in cooperation with the Federal Works Progress Administration. Conclusions as to the rural relief situation based on a study by Hill in cooperation with the Federal Works Progress Administration are also given. Findings by G. S. Wehrwein and W. R. Bailey regarding the number of nonconforming land users in 5 counties representative of the 24 northern Wisconsin rural counties having rural zoning ordinances who should be relocated in order to reduce local governmental costs are included.

The cost of isolated settlement in northern Wisconsin, G. S. Wehrwein and J. A. Baker (*Rural Sociol., 2 (1937), No. 3, pp. 253–265*).—Isolation has always been associated with the frontier. "Of more sociological and economic importance, however, is the isolation on the frontiers where some settlers

occupying the better soils live in compact settlements, similar in all respects to any settled agricultural community, [and] others live on isolated tracts, some of them unsuited to agriculture, scattered through the vast areas of cut-over or other forms of marginal land. One such area is in the cut-over area of the Lake States, where much of the settlement has been scattered from the first under the laissez-faire system of letting the settler locate as he pleased. Often he was placed in the midst of the wilderness by some land company knowing that the town would build a road to the settler as soon as he called for it. After the road was constructed the company was able to sell the rest of its holdings to better advantage. In the second place, with the agricultural depression and the increased industrial activity which followed the World War, settlers left this region of pioneer hardships and small incomes to take places in city industries. Many fairly well settled areas were decimated and only isolated farms remained. In spite of the back-to-the-land movement following 1930, much of the isolation remains. In fact, it has been increased in certain areas by the scattering of the newcomers throughout the wild lands instead of settling in established communities. One reason for this uneconomical dispersion is that the land suitable for agriculture is scattered in small islands amidst a sea of submarginal cut-over and wild land."

The conditions prevailing in this area are analyzed.

Interfarm mobility in New York State, W. A. Anderson (*Rural Sociol., 2 (1937), No. 4, pp. 393–401*).—This is an analysis of the shifting of farm operators from farm to farm and the relationship of several factors to the changes.

The data were gathered in four counties representing dairying, fruit, and diversified types of agriculture. Slightly more than 2,900 farm operators were interviewed. They had farmed, on the average, nearly 14 yr., 45 percent from 1 to 9 yr., 26 percent from 10 to 19 yr., and 28 percent 20 yr. or more. Thus nearly one-half had become operators in the decade when depression conditions were setting in or actually operative, while over half were familiar with conditions prior to the depression.

During the 5-yr. period 1930–34 there was an 18 percent mobility of the farmers, while during the 1925–34 period there was a 31 percent mobility. There was less mobility in the 5-yr. period 1925–29, 13 percent.

Some characteristics of white owner and tenant cotton farm families with children 19 to 34 years of age, D. Dickins (*Rural Sociol., 2 (1937), No. 4, pp. 409–414*).—This study was limited to families having at least one child from 19 to 34 yr. of age and residing in five counties of Mississippi, Jefferson Davis, Lauderdale, Sunflower, Tate, and Webster. In each of these counties 50 owner and 50 tenant families were selected at random, varying greatly as to farm situation, though all having cotton as the main cash crop.

Seventy percent of the families had never been broken by death or divorce. An average of 685 children had been born to every 100 natural families. More sons and daughters of owners lived away from home than at home, but more sons and daughters of tenants were at home. Children of both tenure groups living at home were more likely to be sons, largely because daughters married earlier than sons. There were more tenants than owners with large families.

About one-half of the children in the families studied were from 15 to 30 yr. of age. One-fourth were under 15 yr. and one-fourth 30 yr. or older. Owners' children were older than tenants' children, 28 percent of the children of owners being less than 19 yr., while 48 percent of the children of tenants were less than 19 yr.

Tier counties and delinquency in Kansas, M. Smith (*Rural Sociol., 2 (1937), No. 3, pp. 310–322*).—The primary purpose of this study was to ascertain if

distance from cities is as important for juvenile delinquents as for many types of social phenomena.

Some conclusions are that (1) "size of delinquent rates is related to distance from urban communities and that (2) regardless of the absolute size of the focal community, so long as the surrounding regions contain communities not known to be independent of the focal community the relationship holds. These findings agree with data on rural-urban differences in crime and criminals and with studies of the concentric distribution of social phenomena around points of focus or centers of influence and inhibition. In turn, the results may be interpreted as an extension of the theory of pace-setting and dominance in living things, a theory applicable to life in the simpler and more complex biological organisms, to the geographical distribution of social phenomena, and to a certain extent to social organization in general."

Cost and availability of health services in a plateau area, I. C. Wilson (*Assoc. South. Agr. Workers, Proc., 37–38 (1936–37), pp. 252, 253*).—This study was made from May 1 to October 1, 1936, in the trade area of Hindsville, Ark., a village of 205 persons on the western edge of Madison County. The area covers about 150 sq. miles and includes 322 families and 1,292 persons. There were no Negro families.

The total expenditure for health services in the area for the year was $8,275.98. The upland family spends most for medical care, the median expenditure being $11.88 per family, the village family second, the valley third, and the mountain family least, with an expenditure of $7.50. The median expenditure under a $750 income is $9.50, and above, $50. Medical care takes 45 percent of the total expenditure, dental 4, prescribed medicines 18, unprescribed 23, registered nurses 0.8, practical nurses 4, hospitals 5, and ambulance 0.2 percent. Families with a cash income under $750 do not look after their medical needs adequately, and families with a cash income under $1,000 do not look after their dental needs. Thirty-five percent of the families were in debt for medical care to a total amount of $5,948.

The median expenditure for a funeral was $108, the average $145.50.

Rural-urban origins of leaders in education, W. Gee (*Rural Sociol., 2 (1937), No. 4, pp. 402–408*).—The rural-born are found to comprise 61 percent of the educational leadership listed in a directory concerned in approximately 75 percent of its listings with urban educational positions, so that the rural participation looms large in spite of the fact that these educational leaders on the average were born at a time when 71.4 percent of the Nation's population was rural. Moreover, it should be recalled that it was from only the segment of the rural people who left the country for training in the cities that this 61 percent of the future national educational leadership was derived.

Characteristics of persons listed in Rus, J. F. Thaden (*Rural Sociol., 2 (1937), No. 4, pp. 429–443*).—"This study of persons listed in Rus, approximately nine-tenths of whom are specialists in agricultural technics, shows that 83 percent of the men and 60 percent of the women were reared on the farm, or both on the farm and in the town or city.

"Migration of professional agriculturists from State of birth corresponds closely to that of the general population, being small in States from which few native-born have gone and large in States from which many native-born have migrated. However, leaders are approximately two and one-half times as migratory as laymen in comparing State of present residence with State of birth.

"The States that seem to be most proficient in the production of agricultural experts and specialists form a sort of belt across the central and north central part of [the] United States extending as far west as Nevada, with practically all 'low' States lying to the south of this belt and most of the 'medium' States lying to the north or west."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The Advisory Committee on Education: Report of the Committee, F. W. Reeves et al. (*Washington: Govt., 1938, pp. XI+243, figs. 7; also U. S. House Represent., 75. Cong., 3. Sess., Doc. 529 (1938), pp. XII+148, figs. 7*).—This report is noted editorially on page 741.

FOODS—HUMAN NUTRITION

Experimental food study, A. F. Morgan and I. S. Hall (*New York: Farrar & Rinehart, [1938], pp. XVII+3-414, figs. 25*).—This laboratory text for college and university students of home economics is written from the experimental point of view and it presupposes a working knowledge of chemistry. The theoretical discussions that begin each chapter are followed by experiments, with detailed laboratory directions, dealing with problems of food composition and preparation. The appendix contains tables on the chemical composition of foods, weights and measures, and oven baking temperatures, and an explanation of the use of logarithms.

Food, nutrition, and health, E. V. McCollum and J. E. Becker (*Baltimore: Authors, [1936], 4. ed., rev., pp. V+154*).—A revision of the nontechnical handbook noted previously (E. S. R., 71, p. 127).

Man, bread, and destiny, C. C. and S. M. Furnas (*New York: Reynal & Hitchcock, [1937], pp. XIX+364, figs. 3*).—In "the story of man's food," written for the lay public, the authors survey the role of diet in man's life from the earliest times down to the present and summarize the developments in the relatively new science of nutrition. An appendix contains plans for an adequate diet. The 24 pages of references cited suggest the range of topics covered.

[Nutrition studies by the Alabama Station, 1934–35 and 1936] (*Alabama Sta. Rpts. 1934–35, pp. 15–17; 1936, pp. 18–23*).—Progress reports (E. S. R., 74, p. 132) are given on studies in 1934–35 by W. D. Salmon and J. G. Goodman on the vitamin B-sparing action of fats; by Salmon and G. A. Schrader on a comparison of the chick and the rat as experimental animals for assays of vitamins B, G, and B_4; and by C. O. Prickett on the use of the polarizing microscope for the study of myelin degeneration in peripheral nerves. For 1936, results are briefly noted on the physiology of vitamin B deficiency in the rat, by Salmon; a comparison of a limited v. ad libitum feeding of different synthetic vitamin B-deficient diets on their effectiveness in producing spastic beriberi in the rat, an apparent anomaly of dextrinized cornstarch in producing spastic beriberi in the rat, and a comparison of the growth of young rats fed either various purified synthetic diets supplemented with brewer's yeast, the same diets supplemented with autoclaved yeast plus vitamin B solid, or a stock diet, all by Schrader and Prickett; symptomatology and pathology of potassium and magnesium deficiencies in the rat and the chick, by Schrader, Prickett, and Salmon; a comparison of the polarized light, Marchi, and Sudan III methods for the diagnosis of myelin degeneration in peripheral nerves, by Prickett; the occurrence of hemorrhagic foci in the brains of rats showing symptoms of spastic beriberi, by Prickett and Schrader; the use of Petrunkevitch's cupric-phenol and cupric-paranitrophenol fixatives on the tissues of the rat, by Prickett

and C. Stevens; and vitamin A studies of cowpeas and soybeans, and the effect of pigmentation in cowpeas and soybeans upon their canning quality, both by W. C. Sherman.

[Studies in foods and nutrition by the Wisconsin Station] (*Wisconsin Sta. Bul. 439 (1937), pp. 1, 2, 3–5, 6, 15–24, fig. 1*).—Included in this progress report are summaries of studies, several of which represent extensions of earlier work (E. S. R., 77, p. 562), by C. A. Elvehjem, R. J. Madden, F. M. Strong, and D. W. Woolley on the preparation of the antipellagra factor, nicotinic acid amide, from liver (pp. 1, 2); by Elvehjem, O. Mickelsen, and H. A. Waisman on the vitamin B_1, B_2, B_4, and the factor W content of meats and animal organs (pp. 3, 4); by Elvehjem and A. Arnold on the food sources of vitamin B_1 (p. 4); by D. V. Frost and Elvehjem on a new dietary factor in the vitamin B complex, factor W (p. 5); by E. J. Lease and H. Steenbock on the destruction of vitamin A in rancid fats (p. 6); by G. O. Kohler, Elvehjem, and E. B. Hart on the value of liver for the prevention of nutritional anemia in rats (pp. 15, 16); by P. B. Pearson, Elvehjem, and Hart on the comparative effects of proteins from nine different sources on the regeneration of hemoglobin in anemic rats (p. 16); by E. J. Underwood on the effect of cobalt on hemoglobin formation in anemic rats (pp. 16, 17); by V. R. Potter, Elvehjem, and Hart on the relation of copper and vitamin C to nutritional anemia in the guinea pig (p. 17); by H. H. Schneider and Steenbock on the effects of feeding low phosphorus rations to rats (p. 18); by R. J. Evans, P. H. Phillips, and Hart on the effect upon growth and tooth development in rats following the addition of fluorine to a low fluorine diet (p. 18); by H. Parsons, B. Fuller, and A. Noble on the conservation of vitamin C in home and commercially canned sauerkraut (p. 19); by D. Husseman on the vitamin C content of home-canned tomato juice (p. 20); by D. Johnson and Parsons on the vitamin B content of whole and puffed wheat cereals (p. 20). by Parsons, Johnson, A. Marlatt, and V. Rohrer on the effect of oven roasting on the nutritive value of soybeans (pp. 21, 22); by M. Reynolds, E. Meiller, and L. Hill on the nutritional status of college women (pp. 22, 23); by Parsons, J. Lease, Johnson, and Rohrer on the animal organ sources and storage of the food factor which protects against egg white injury (pp. 23, 24).

Effect of thawing and cooking frozen pork and beef, A. M. Child and P. Paul (*Minnesota Sta. Tech. Bul. 125 (1937), pp. 11*).—The authors investigated the effect of freezing and of different thawing temperatures upon the palatability of pork chops and loin roasts, standing beef roasts, porterhouse steaks, and rump pot roasts and upon the thawing and cooking time, losses, press fluid, drip, total moisture, and tenderness of center loin cuts of pork. The freezing was done in a cabinet at −18° C., with the meat wrapped in moisture-proof paper and left until frozen solid. The roasts were thawed at 175° in a preheated electric oven until the internal temperature reached 5°, the steaks under a broiler flame with the oven regulator set at 175°, the chops by searing on each side in a pan, and the pot roasts by searing in a pan, adding water, and simmering until a skewer could be forced through the meat.

For the palatability tests the cuts were thawed at from 24° to 25°, uncovered, in the laboratory, in a conditioning room with constant humidity at 65 percent, and in a mechanical refrigerator at a temperature of from 2° to 4°. The methods of the cooking committee of the Cooperative Meat Investigations were followed in the cooking, sampling, and judging. The beef roasts were cooked uncovered to 58° and the pork roasts to 84° in a 175° oven. The steaks were broiled under a gas flame with the oven control at 175° and the rack 5½ in. below the flame to an internal temperature of 40° on one side

and 58° on the other. The chops were breaded, browned, two tablespoonfuls of water added, covered, and simmered for 1 hr. The pot roasts were seared, ½ cup of water added, covered, and simmered for 2 hr. The samples for testing were obtained from the center of the roasts and the large muscle of the steaks and chops. A panel of four judges was used for the palatability tests, and the scores were checked against the paired judgments of about 15 people. The tenderness was also measured by the Minnesota Shear Stress apparatus.

The palatability and tenderness of the cuts tested were not significantly affected by freezing and by the different thawing temperatures. The pork roasts thawed at 175° required a mean time of 31.5 min. per pound and a cooking time of 46.2 min. as compared to 254.2 min. thawing time and 54.9 min. cooking time for the roasts thawed at from 24° to 25°. Unfrozen roasts required 57.1 min. per pound cooking time. The roasts thawed at 175° had a mean evaporation loss of 1.78 percent by weight, total losses of 20.6, press fluid content of 47.48, freezing drip 16.69, and total moisture content of 65.37 percent as compared to a mean gain in weight of 1.62 percent (attributed to the high humidity of the conditioning room), total losses 19.16, press fluid 49.4, freezing drip 15.8, and total moisture content 64.78 percent for the roasts thawed at from 24° to 25°. Unfrozen pork roasts had a mean total loss of 19.13 percent, press fluid content 43.67, freezing drip 16.36, and total moisture content of 64.43 percent. Statistically the differences in total moisture and freezing drip losses were not considered to be significant, nor was the difference in total losses between the frozen pork thawed at from 24° to 25° and the unfrozen pork.

Effect of freezing and thawing beef muscle upon press fluid, losses, and tenderness, P. Paul and A. M. Child (*Food Res., 2 (1937), No. 4, pp. 339–347*).—The method followed in this investigation conducted by the Minnesota Experiment Station is described in the report noted above. The differences between frozen roasts thawed at different temperatures and between unfrozen and frozen roasts were studied in 12 pairs of rolled rib beef roasts.

The roasts thawed at 175° C. and cooked at that temperature to an internal temperature of 58° had a mean total loss of 20.41 percent, press fluid 43.66, drip 15.71, and total moisture content 68.36 percent as compared to 18.34 percent, 44.15, 16.23, and 67.9 percent for the roasts thawed at from 24° to 25° and cooked under similar conditions. In the comparison of frozen and unfrozen roasts, the frozen beef thawed at 175° before cooking had a mean total loss of 18.19 percent, press fluid 44.1, drip 17.1, and total moisture content 68.83 percent and for the unfrozen roasts after cooking the values obtained were 14.59, 47.28, 18.23, and 69.77 percent, respectively. Statistically the differences in total moisture, drip, and tenderness were not considered to be significant.

Fat as a factor in palatability of beef, D. L. Mackintosh and J. L. Hall (*Kans. Acad. Sci., Trans., 39 (1936), pp. 53–58, figs. 4*).—In this contribution from the Kansas Experiment Station, data are presented to show that the degree of finish or fatness of beef appears to be associated with palatability. The grading was done on carcasses from animals of different ages fed under varying conditions and fattened on different rations, using the standard grading chart to record the degree of outside covering of fat, the intramuscular fat, and the marbling. For chemical analysis the ninth to eleventh rib roast was selected, and the corresponding roast on the opposite side of the animal was cooked and the palatability was measured by a committee of trained judges scoring for tenderness, flavor, and juiciness. The tenderness was also measured by the mechanical shear.

A highly significant correlation was found between the external covering of the carcass and the marbling. The marbling appeared to be closely related to the tenderness as measured by the palatability committee and by the mechanical

shear, and to be associated with the juiciness and the flavor as measured by the committee.

Some studies on the nutritional value of milk, A. VALENZUELA (*Philippine Jour. Anim. Indus., 4 (1937), No. 5, pp. 403–406, pl. 1, figs. 2*).—The total nutritive value of raw, pasteurized, and reconstituted cow's milk was studied in a feeding experiment with three groups of rats maintained on a diet consisting wholly of milk. To prevent nutritional anemia, 0.5 mg of ferric chloride and 0.16 mg of copper sulfate were dissolved in the daily milk ration. Three other groups of rats were given a vitamin B complex-deficient diet consisting of cornstarch 64 parts, purified casein 18, agar agar 2, McCollum salt mixture No. 185 4, cod-liver oil 2, and Crisco 10 parts, and upon the appearance of symptoms of neuritis and failure to grow the ration was supplemented with 5, 10, 15, and 20 cc of raw, pasteurized, and reconstituted milk.

The growth curves show that the rats receiving the raw milk diet had the greatest weight gain, followed closely by those receiving the pasteurized milk. The rats receiving the reconstituted milk, which is made from milk constituents that have undergone severe heat treatment, showed a considerably lower average weight gain. Fair growth was promoted and the neuritis was cured in the groups of rats receiving the basal ration supplemented by 10 cc of raw milk, 15 cc of pasteurized milk, and 20 cc of reconstituted milk.

Cake-making quality of eggs as related to some factors in egg production, F. B. KING, E. F. WHITEMAN, and W. G. ROSE (*Cereal Chem., 13 (1936), No. 6, pp. 703–711*).—In continuation of a study noted previously from the U. S. D. A. Bureau of Home Economics (E. S. R., 75, p. 564), the authors investigated the effect of the diet of the hen and the season of the year or the laying cycle of the hen on the properties of the eggs and on cakes in which the eggs were used.

A relationship was demonstrated between the specific volume, elasticity, and compressibility of the sponge cakes and between the pH and specific gravity of the batter from which the cakes were baked, but not between any of these variables and the physical and chemical measurements made on the eggs.

The baking strength of flour, M. J. BLISH (*Northwest. Miller, 192 (1937), No. 1, Sect. 2, pp. 30, 31*).—In this review article the author confines the discussion largely to a consideration of gluten and its properties.

Correlation of experimental and commercial baking tests when using sponge doughs, II, C. N. FREY, J. FREILICH, and H. EKSTEDT (*Cereal Chem., 14 (1937), No. 5, pp. 629–660, figs. 16*).—In continuation of the investigation noted previously (E. S. R., 76, p. 877), the authors studied the different steps in the sponge dough procedure, using a commercial type formula and the same ingredients in the laboratory and large-scale baking methods. The bread made in the laboratory from sponge dough was similar in internal character to bread made in the bakery, the slight external differences noted being attributed to oven variations.

Some factors affecting culinary quality of potatoes, O. SMITH (*Amer. Potato Jour., 14 (1937), No. 7, pp. 221–224*).—In this preliminary report the author presents data on the effect upon culinary quality of the Smooth Rural variety of potato of the soil reaction, the presence of potassium and nitrogen in the soil, the moisture and temperature during the growing season, and the use of bordeaux spray mixture and of fertilizer.

Spinach and kale in frozen pack.—I, Scalding tests. II, Microbiological studies, H. F. SMART and B. C. BRUNSTETTER (*Food Res., 2 (1937), No. 2, pp. 151–163*).—In the scalding tests the authors present data to show that the maximum retention of quality in frozen pack spinach and kale is obtained by a scalding in steam for 3 and 5 min. respectively. The addition of a 0.24-percent

solution of calcium chloride to the blanched spinach before freezing improved the quality of some of the packs. A storage temperature of −17.8° C. protected the packs from loss of color, flavor, and texture.

In the microbiological studies the microbial content of the spinach and kale was reduced more than 99 percent by scalding and freezing, followed by storage at −9.4°. Wholesome products were obtained by using good-quality vegetables and subjecting them to prompt cooling and freezing, and just prior to or immediately after defrosting immersing them in a boiling water bath.

Organic acids of the ripe banana, P. L. Harris and G. L. Poland (*Food Res. 2 (1937), No. 2, pp. 135–142, fig. 1*).—The authors report the results of qualitative tests to show that *l*-malic acid is the principal nonvolatile organic acid present in the ripe banana. The range of variation of the malic acid content during ripening was from 0.53 to 0.373 percent, with a value of approximately 0.314 percent for the stage of ripeness at which the banana is generally consumed. The titratable acidity of the ripe fruit, which serves as a measure of the *l*-malic acid content, was found to be approximately 4.8 cc of N alkali per 100 g of banana, with a variation during ripening of from approximately 2.8 to 5.4 cc.

Composition of citrus fruit juices, J. A. Roberts and L. W. Gaddum (*Indus. and Engin. Chem., 29 (1937), No. 5, pp. 574, 575*).—In this study, conducted at the Florida Experiment Station, samples of hand-extracted juice from Florida-grown seedling, Blood, Valencia, and Lue Gim Gong varieties of oranges, Marsh Seedless and seedy varieties of grapefruit, and the tangerine were completely analyzed, following methods described by the Citrus Fruit Inspection Bureau of the Florida State Department of Agriculture and the A. O. A. C. Spectrographic examination of the calcium precipitate obtained by the A. O. A. C. method was made to serve as an index to the proportions of the elements present through contamination. In addition to the mineral elements previously reported present, the samples analyzed contained strontium, barium, aluminum, chromium, and appreciable amounts of manganese and copper.

Gas content of cranberries and possible relationship of respiratory activity to keeping quality, W. B. Esselen, Jr., and C. R. Fellers (*Plant Physiol., 12 (1937), No. 2, pp. 527–536, fig. 1*).—In this study, conducted at the Massachusetts Experiment Station, the authors analyzed the gas contained in the voids of cranberries, and determined the effect of various environmental factors on the composition of the internal atmosphere of cranberries of the Howes and Early Black varieties. The catalase activity was determined at weekly intervals.

The results show that the rate of respiration is increased in cranberries left on the vines after maturity and is highest when the fruit left on the bog is submerged in water. The rate of respiration is materially reduced in cranberries which have been frosted. The oxygen and carbon dioxide contents of the internal gas vary with the rate of respiration, while the nitrogen content is relatively constant and is similar to that of the atmosphere. Cranberries of the Early Black variety remained in good condition for over 3 mo. and those of the Howes variety for 7 mo. when stored at 3° C. The samples of both varieties stored at 24° broke down and decayed in approximately 20 days. Since the carbon dioxide content and the carbon dioxide: oxygen ratio of the Howes variety were considerably higher than those of the Early Black variety, it would appear that the keeping quality of cranberries varies directly with the carbon dioxide content and the carbon dioxide: oxygen ratio.

The data obtained indicate that by studying the carbon dioxide: oxygen ratios, based on the internal atmosphere of cranberries, it is possible to determine the length of time that cranberries may be kept in cold storage

before internal break-down sets in. No significant correlation was demonstrated between the catalase activity and the respiratory activity of cranberries in storage.

Paper mill sanitation in relation to the manufacture of food wraps and containers, J. R. SANBORN (*Jour. Bact.*, *34* (*1937*), *No. 3*, *pp. 347*, *348*).—In this brief note from the New York State Experiment Station attention is called to the necessity for setting sanitary and bacteriological standards for plants engaged in the fabrication and handling of food wraps and containers.

Metabolic studies of human subjects on a skimmed milk and banana diet, R. SAINSBURY and M. C. SMITH (*Jour. Home Econ.*, *29* (*1937*), *No. 7*, *pp. 468–471*).—In the first part of the study the effect on 12 women of a reducing diet consisting of approximately 1 qt. of skim milk and six bananas was studied during a 6-day period divided into a 2-day period of dietary adjustment and a 4-day balance period. The daily energy expenditures of the subjects ranged from 2,243 to 3,266 calories and the energy intakes from 600 to 1,037 calories. The losses in body weight during the 6-day period varied from 4 to 10 lb., of which from 1 to 3 lb. was estimated to be due to the loss of water and the emptying of the intestinal canal. The hemoglobin concentration was decreased by from 0.8 to 2.7 g per 100 cc of blood, the erythrocyte count was not altered appreciably, the urinary acidity remained within the normal range, and no acetoacetic acid was demonstrated in the urine. The average daily retentions of calcium ranged from 0.014 to 0.718 g and of phosphorus from 0.029 to 0.637 g. Nitrogen losses ranging from 0.09 to 3.02 g per day were shown by 10 of the 11 subjects tested, and one showed a nitrogen retention of 1.52 g. The majority of the women found the diet to be "extremely monotonous and increasingly distasteful."

In the second part of this study similar tests, with the exception of calcium and phosphorus balances, were conducted on 6 subjects maintained on the reducing diet in which from 72 to 191 g of lean beef had been substituted for part of the bananas. The daily energy intakes ranged from 737 to 1,269 calories.

In these subjects, 4 of whom had served in the first part of the study 6–9 mo. previously, the total loss in body weight varied from 3 to 7 lb. The concentration of hemoglobin in the blood increased in 4 subjects by from 0.15 to 0.71 g and decreased in 2 snbjects by 0.46 and 0.36 g per 100 cc of blood, respectively, the urinary acidity lay within the normal range, and a daily retention of nitrogen varying from 3.2 to 7 g was fonnd in 5 subjects, with 1 showing a nitrogen loss of 3.2 g. The addition of meat to the reducing diet was reported to have made it more palatable and less monotonous.

The basal metabolism and urinary nitrogen excretion of Chinese, Manchus, and others of the Mongolian race, F. G. BENEDICT, L. C. KUNG, and S. D. WILSON (*Chin. Jour. Physiol.*, *12* (*1937*), *No. 1*, *pp. 67–100*, *fig. 1*).—The Benedict field apparatus (E. S. R., 60, p. 893) was used to measure the basal metabolism of 65 men and 55 women of the Mongolian race, chiefly Chinese and Manchus ranging in age from 15 to 87 yr. and judged to be in good nutritive condition according to the pelidisi. Observations on the urinary nitrogen excretion were made in some cases. The following are some of the findings reported:

The nitrogen output per kilogram of body weight tended to decrease with age and was essentially the same as that noted for Caucasians. On the basis of the heat production per square meter of surface area, the Chinese and Manchu men had an average metabolism of 880 calories as compared to 925 calories for Caucasians, while the Chinese and Manchu women averaged 825 calories as com-

pared to 850 calories for the Caucasian women. In comparison with the Aub and Du Bois prediction standards the deviation from prediction in the measured metabolism of the oriental men and women averaged −5.4 and −5.9 percent, respectively. The total heat production increased with increasing body weight and was lower with older subjects than with younger subjects of the same weight. "No significant influence of western civilization upon the metabolism of those Chinese who had adopted western ways of living was noted. The data suggest that active physical labor has a positive effect in increasing the heat production."

Note on the nutritive value of "Glaxo" and "light white" caseins, A. F. Morgan and E. O. Greaves (*Biochem. Jour., 31 (1937), No. 9, pp. 1553–1555*).—The growth and maintenance value of a vitamin-free commercial casein (Glaxo), a light white casein of the British Drug Houses, and raw and heated acid-precipitated commercial casein prepared in California were determined, following the technic described previously (E. S. R., 65, p. 789). The following growth values estimated in growth per gram of protein eaten at an 8–10 percent level in the diet in 4–5 weeks by weanling rats are reported: Glaxo 1.69, light white casein 1.64, and California casein heated at 140° C. for 30 min. 1.71 and raw 2.1. The maintenance values obtained, expressed as biological values, are as follows: Glaxo 50, light white casein 51, and California casein heated 57 and raw 69. "Therefore the improvement brought about by the substitution of light white for Glaxo casein in the experiment of Coward et al. [E. S. R., 66, p. 591]. . . . must be ascribed to something other than superior value as protein."

Globin utilization by the anemic dog to form new hemoglobin, F. S. Robscheit-Robbins and G. H. Whipple (*Jour. Expt. Med., 66 (1937), No. 5, pp. 565–578*).—Data are presented to show that the oral administration to anemic dogs of 100 g of globin from the horse and dog resulted in the formation of from 30 to 40 g new hemoglobin. "The globin radicle of hemoglobin appears to be an important limiting factor in abundant hemoglobin building in this type of anemia due to blood loss."

The influence of some commonly used salt mixtures upon growth and bone development of the albino rat, L. B. Mendel, R. B. Hubbell, and A. J. Wakeman (*Jour. Nutr., 14 (1937), No. 3, pp. 261–272*).—The efficiencies of the four salt mixtures, Osborne-Mendel, McCollum No. 185, Steenbock No. 40, and Sure's modification of the Steenbock No. 32 mixture, were evaluated at various levels of intake by determining the rate of change in body weight to 200 g of 45-g male rats, placed on a diet containing casein 18 percent, butterfat 9, lard 20, dried yeast 8 g, and the remaining 45 percent consisting of starch and the various salt mixtures, and by determining the amount of calcification in the femurs.

At the level of salts commonly used in the experimental diet, 4 percent of the ration, the average daily rate of growth was 5.2 g for both the Osborne-Mendel and the McCollum salts, 5 for the Sure, and 4.7 for the Steenbock salt mixtures, with an average percentage of ash in the dry fat-free femurs of 60.8, 57.9, 59, and 59.2 percent, respectively. Satisfactory growth was maintained with the salt intake at 2- and 3-percent levels, but the calcium content was insufficient for adequate bone formation. The addition of sufficient calcium carbonate to furnish an amount of calcium equal to that supplied by 5 percent of Osborne-Mendel salt mixture to the 1-percent level of each of the four mixtures resulted in a rate of growth varying from 5 to 5.8 g daily and a calcification of from 57.7 to 59.5 percent. The data would indicate that the four mixtures are not interchangeable in the diet of the rat at the eight levels studied.

A new salt mixture for use in experimental diets, R. B. HUBBELL, L. B. MENDEL, and A. J. WAKEMAN (*Jour. Nutr., 14 (1937), No. 3, pp. 273–285*).—In continuation of the paper noted above, a new salt mixture designed for use as a substitute for the Osborne and Mendel salt mixture is described. The suitable amount of Osborne and Mendel salts to be used as a basis for the modified mixture was determined, following the procedure described in the preceding paper. The new mixture, No. 351, contains trace elements, including iron, and calcium carbonate equivalent to the amount in the 4- and 5-percent Osborne-Mendel salts in combination with the other constituents present in the amounts contained in the 1- and 2-percent mixtures and with copper added to give the following composition: $CaCO_3$ 543 g, $MgCO_3$ 25, $MgSO_4$ 16, NaCl 69, KCl 112, KH_2PO_4 212, $FePO_4.4H_2O$ 20.5, KI 0.08, $MnSO_4$ 0.35, NaF 1, $Al_2(SO_4)_3K_2SO_4$ 0.17, and $CuSO_4$ 0.9 g in 1,000 g of the mixture.

Series of tests were made to demonstrate that the new mixture can replace the Osborne-Mendel mixture for use in experimental studies. When used at the level of 2 percent in the diet the rate of growth of the rats averaged 5.3 g and the calcification 58.9 percent as compared to 5.3 g weight gain and 58.4 percent calcification at the 4-percent level of the Osborne-Mendel salt mixture.

Effect of restriction of inorganic salts in the diet on organ growth, P. P. SWANSON and A. H. SMITH (*Amer. Jour. Physiol., 116 (1936), No. 3, pp. 516–523*).—In continuation of previous work (E. S. R., 73, p. 874), this paper deals with the changes in the spleen, adrenals, testes, and heart following strict limitation of mineral salts in the diet of the albino rat. Groups of rats were placed on an adequate synthetic diet, an adequate diet except for limited energy intake, and a diet low in inorganic constituents for a 90-day experimental period. Other animals received adequate and salt-poor diets and were killed after 21, 42, and 63 days of experimental feeding.

A deficiency of inorganic salts in the diet resulted in a short period of subnormal growth, followed by a distinct regression in weight. Examination of the organs revealed that the heart weighed significantly less in the experimental animals, and the testes were smaller at the end of the experiment. The lack of inorganic salts produced a subnormal spleen, indicating an inhibiting effect on splenic development. During the first part of the experiment the adrenals exhibited compensatory changes, followed by a progressive shrinkage concomitant with an increased and sustained water content of the blood and the muscles. In spite of shrinkage, the kidneys and adrenals were larger than were those organs in normal animals of equal size. The results suggest a possible relationship existing between the adrenal hormones and the regulation of salt metabolism.

The influence of specific mineral deficiencies on the growth of body and organs of the rat, E. S. EPPRIGHT and A. H. SMITH (*Jour. Nutr., 14 (1937), No. 1, pp. 21–33, fig. 1*).—This paper is a continuation of the one noted above and deals with the effect of modifying the mineral content of the otherwise adequate diet by restricting the intake of the Osborne and Mendel salt mixture and supplying varying amounts of mineral supplements. The animals were killed after 60 days on experiment, and the organs were removed and weighed.

Of the mineral supplements tested, calcium and phosphorus were found to be the most effective, as shown by the greatest increase in body weight, the maintenance and size of the thymus, and the general nutritive well-being. The presence of sodium and potassium in the experimental diet is necessary "to support the maximum development possible on the given energy and protein allowance."

Subacute magnesium deficiency in rats, E. WATCHORN and R. A. MCCANCE (*Biochem. Jour., 31 (1937), No. 8, pp. 1379–1390, figs. 2*).—A series of experiments was conducted on male and female rats receiving an otherwise adequate diet containing approximately 40 p. p. m. of magnesium. The signs of magnesium deficiency were noted during the 3-mo. experimental period and at post mortem. The blood serum was analyzed for calcium, magnesium, and phosphatase and the bones and teeth for phosphorus as well, and the various tissues for calcium, magnesium, sodium, and phosphorus. The following are some of the symptoms noted:

Beginning about the tenth day the rats developed diarrhea and melena, followed during the next 7–10 days by hyperemia of the skin, loss of hair, and, in some cases, hyperpnea and nervousness. Thereafter the animals appeared normal until near the end of the experimental period. At about the fourteenth day on the diet the blood magnesium was reduced to about half the normal value and remained at the lower level. At post mortem the kidneys were found to be calcified, the bones brittle, and in some animals the teeth white or translucent. The magnesium content of the bones was reduced to approximately two-thirds and that of the teeth to one-half of the normal range, while the content in the tissues decreased only slightly. The phosphorus content of the teeth was reduced, and extensive histological changes were noted. The water content of the bones, teeth, and kidneys was increased, and the phosphatase of the blood, bones, and kidneys remained normal.

Effect of adding copper to the exclusive milk diet used in the preparation of anemic rats upon their subsequent response to iron, M. C. SMITH and L. OTIS (*Jour. Nutr., 14 (1937), No. 4, pp. 365–371, figs. 2*).—In continuation of a previous study (E. S. R., 78, p. 281) and using the Elvehjem and Kemmerer technic (E. S. R., 67, p. 90) for the production of anemia, groups of rats maintained on the whole milk diet were given at the end of 4 weeks 0.05 mg of copper sulfate daily for from 1 to 2 weeks to insure the presence of ample copper for the conversion of all residual iron into hemoglobin. During the following 6 weeks' experimental period, graded portions of iron as ferric chloride, with copper and manganese, were administered, and the gain in hemoglobin concentration was compared with the hemoglobin regeneration of animals which received the same amount of iron during the experimental period but no supplemental copper in the anemia production period.

The results are similar to those obtained by Schultze and Elvehjem (E. S. R., 70, p. 872), and it is concluded that "animals which do not have their iron reserves depleted in the presence of copper regenerate much more hemoglobin in response to subsequent iron and copper supplementation than do rats which have been given sufficient copper in the preparation period for complete utilization of iron stores." The response to iron and copper supplementation was much less in the females that received copper in the foreperiod than in those deprived of copper, although the former group exhibited a higher hemoglobin concentration at the beginning of the experimental period. This fact is offered as further evidence for the belief that a low hemoglobin concentration cannot be used as an indication of the absence of residual iron, "for the store was obviously less in the females receiving copper in spite of their higher hemoglobin concentrations."

The effect of copper in the production of nutritional anemia in rats, P. L. HARRIS and G. L. POLAND (*Science, 87 (1938), No. 2246, pp. 45, 46*).—Data are presented to show that the supplementation of the basal diet with copper during the anemia production period, as described by Smith and Otis in the paper noted above, does not significantly affect the time or the severity of iron depletion nor does it affect the hemoglobin response to subsequent iron feeding. Rats maintained on the anemia-producing diet in which whole milk

powder had been substituted for whole fresh milk, with a daily supplement of 0.05 mg of copper as copper sulfate, when fed a daily curative supplement consisting of 0.1 mg of iron, 0.05 of copper, and 0.04 mg of manganese for a period of 6 weeks showed about the same hemoglobin response as did the rats depleted on the same diet without copper supplement. A sex variation in the response to iron regardless of the depletion technic was noted, the female rats showing a lower gain in hemoglobin during the 6 weeks' curative period than was shown by the male rats.

Further studies on the effects of NaF administration upon the basal metabolic rate of experimental animals, P. H. Phillips (*Amer. Jour. Physiol., 117 (1936), No. 1, pp. 155–159*).—Following the procedure described in a previous study (E. S. R., 74, p. 883) at the Wisconsin Experiment Station, the author presents further data to show that the administration of sodium fluoride to experimental animals does not reduce the normal metabolic rate. No evidence was found to indicate that thyrotoxicosis can be controlled by sodium fluoride feeding.

Cryolite spray residues and human health, S. Marcovitch, G. A. Shuey, and W. W. Stanley (*Tennessee Sta. Bul. 162 (1937), pp. 46, figs. 7*).—In this study experimental data are presented on the toxicity of fluorine in drinking water and in spray residues, as determined by the presence of mottled enamel on the lower incisors of rats receiving diets containing fluorine compounds. It is concluded that 4 p. p. m. in the diet or 0.4 mg of fluorine per kilogram of body weight was not injurious to the teeth or health of the experimental rats. This value is calculated to be equivalent to 6 mg of fluorine per day for a 30-lb. child. On the basis of their findings the authors contest the validity of the present tolerance of 0.01 grain of fluorine per pound of foodstuffs. Data are also presented on the effect of fluorine on plants and on the content of fluorine, calcium, and phosphorus in the larvae of the Colorado potato beetle.

Vitamin A and carotene determinations on a sample of commercial butter, B. L. Kunerth and E. Leuschen (*Kans. Acad. Sci., Trans., 39 (1936), pp. 191–195*).—In this study, conducted by the Kansas Experiment Station, preliminary data are presented to show that the total vitamin A activity of a sample of commercial butter purchased in February is about 18 international units per gram of butterfat, as estimated from readings made in a visual spectrophotometer and a quartz spectrograph.

Vitamin A activity of butters determined by various methods, M. E. Leuschen, B. L. Kunerth, and M. M. Kramer (*Jour. Nutr., 14 (1937), No. 3, pp. 247–259, fig. 1*).—In this study, conducted at the Kansas Experiment Station, vitamin A values were determined for a commercial winter butter and for butters made from composite 24-hr. samples of the secretions of the first, fifth, and thirtieth days of lactation of a Holstein and two Jersey cows. Using a visual spectrophotometer the blue color obtained with stannous chloride was measured and the readings at 583 and 620 mμ were compared with the value of the extinction coefficient $E\left\{\begin{matrix}1\text{ percent}\\1\text{ cm}\end{matrix}\right.$ "pure" vitamin A $=2{,}600$ and 5,000, respectively, and readings were made by a quartz spectrograph of the absorption spectra at 328 mμ, the percentage of vitamin A being obtained by comparison with $E\left\{\begin{matrix}1\text{ percent}\\1\text{ cm}\end{matrix}\right.$ pure vitamin A $=1{,}600$. The amount of carotene was determined spectrophotometrically at 455, 470, and 480 mμ, using the formula $E\left\{\begin{matrix}1\text{ percent}\\1\text{ cm}\end{matrix}\right.$ β-carotene $=2{,}270$, 2,000, and 2,120, respectively. The total vitamin A values were determined by biological assay and were compared with the

results of adding the carotene determinations to the stannous chloride values and with the values obtained at 328 mμ.

The total vitamin A values, expressed as international units per gram of butterfat and reported for the commercial sample, were 11 by the stannous chloride plus carotene determinations, 18 by the 328 mμ plus carotene determinations, and 35 by biological assay. By the same three methods of determination the butterfat of the colostrum from the Holstein cow showed values of 65, 165, and 205, respectively, and from the two Jersey cows 79 and 68, 160 and 122, and 184 and 99 international units, respectively. The butterfat produced by the same cows on the fifth day of lactation contained only from one-fifth to one-ninth the amount of vitamin A present in the colostrum, and still lower values were obtained for the butterfat taken on the thirtieth day of lactation. The carotene contents of the colostral butters were highest, with decreasing values noted as the period of lactation progressed. The commercial butter had a carotene content similar to those of the 30-day samples. In general the summations including the determinations of vitamin A at 328 mμ plus carotene values were in better agreement with the results of the biological determinations.

Differences in the chromogenic properties of fresh-water and marine fish liver oils, E. LEDERER, V. ROSANOVA, A. E. GILLAM, and I. M. HEILBRON (*Nature [London], 140 (1937), No. 3536, p. 233*).—Evidence is presented to suggest that the 693 mμ chromogen reported for liver oils from certain Russian fresh-water fish may be a second vitamin A.

A possible vitamin A_2, J. R. EDISBURY, R. A. MORTON, and G. W. SIMPKINS (*Nature [London], 140 (1937), No. 3536, p. 234*).—In a brief note the authors report the presence of a new material designated as vitamin A_2 in nonsaponifiable extracts from the livers and viscera of brown trout. The value expressed is based on the pure substance having an extinction coefficient $E^{1\ \text{percent}}_{1\ \text{cm}}$ 693 mμ ≮ 5,000. With the antimony trichloride color test for vitamin A, the 693 mμ band was encountered in halibut-liver and visceral oils, rarely detectable in cod-liver oils, and absent from whale-liver oils. "It seems clear that the 693 mμ chromogen is not in any simple sense an artefact derived from vitamin A but the position remains obscure with regard to bands at 640 mμ and 660 mμ which occasionally appear in the color test."

The degree and prevalence of vitamin A deficiency in adults, with a note on its experimental production in human beings, H. JEGHERS (*Jour. Amer. Med. Assoc., 109 (1937), No. 10, pp. 756–761, figs. 3*).—Biophotometer tests made on 162 young adults revealed that 35 percent had subnormal dark adaptation and 12 percent had clinical manifestations of vitamin A deficiency. None of the subjects had been taking vitamin A concentrates, as shown by a careful dietary and general history recorded for each subject. Of the group, the 50 showing the best dark adaptation we.e considered to be the normal group. When their dark adaptation curves were compared with those obtained for the 50 subjects showing the poorest, who comprised the subnormal group, the respective average daily intake, of international units of vitamin A were 5,560 and 2,445 units.

The successful treatment of the subnormal cases consisted of the daily oral administration of 70,000 international units of vitamin A in the form of carotene in oil and halibut-liver oil concentrates for 2 weeks, followed by 25,000 units daily until the dark adaptation became normal and the clinical symptoms disappeared. Evidence is presented to show the relationship between vitamin A deficiency and the danger of driving an automobile at night. It is recommended that the minimal daily requirement of healthy adults for vitamin A should be set at 4,000 international units and that to secure optimal benefits the dosage should be increased by 50 percent.

Avitaminosis.—XIX, Nerve degeneration in albino rats as studied by the freezing-drying method and polarized light with deficiency of vitamin A or of vitamin B, J. LEE and B. SURE (*Arch. Path., 24 (1937), No. 4, pp. 430–442, figs. 3*).—In addition to the findings previously noted from another source (E. S. R., 77, p. 137), the authors report that sections of cerebrum, cerebellum, and pons from rats deficient in vitamin B_1 and in the vitamin B complex, when fixed and dehydrated by the freezing-drying method and stained with hematoxylin and eosin or the Giemsa stain, failed to show the presence of any histological changes.

Using the polarized light technic, as described previously, the spinal cord and the sciatic, trigeminal, and optic nerves from rats deficient in vitamin A, when fixed in solution of formaldehyde, showed myelin degeneration but no change in the axis cylinders. Similar results are reported for the same nerves from rats deficient in the vitamin B complex, while varying degrees of myelinization, accompanied by broken axis cylinders in the later stages, were found in the nerves from rats deficient in vitamin B_1.

The vitamin B_2 complex.—Differentiation of the antiblacktongue and the P.-P. factors from lactoflavin and vitamin B_6.—VII, Experiments with monkeys and other species, L. J. HARRIS (*Biochem. Jour., 31 (1937), No. 8, pp. 1414–1421, figs. 8*).—In continuation of a series of studies (E. S. R., 76, p. 423), the author describes the results of tests with monkeys and makes some further observations on experiments with dogs, rats, and pigeons. The basal diet, which was a modification of the blacktongue diets of Goldberger et al. and Rhoads and Miller, was rich in vitamin B_6 and contained only small amounts of lactoflavine. The following supplements were given: Dried yeast, "343" liver powder, herring, and lactoflavine, and wheat was substituted for the corn in the ration. The effect of irradiation was studied in the experimental monkeys subjected three times a week for from 10 to 45 min. to a carbon arc lamp at a distance of from about 2 to 3 ft.

The results indicate that monkeys resemble dogs and humans in their inability to survive on a diet deficient in the P–P factor and in their response to materials rich in this factor, such as 343 liver powder and yeast or by the substitution of wheat for corn in the basal diet. The conclusion stated in previous papers in the series is confirmed that dogs need supplements of vitamin B_6 and the antiblacktongue factor to prevent nutritive failure on a synthetic diet containing vitamin B_1 and lactoflavine, and rats need lactoflavine and vitamin B_6, while humans and monkeys require the P–P factor. The irradiation treatment did not appear to aggravate the pellagrous condition in the monkeys.

Effect of vitamin B deficiency on heat production of the rat, L. VORIS (*Jour. Nutr., 14 (1937), No. 2, pp. 199–213*).—In continuation of studies conducted at the Pennsylvania Experiment Station (E. S. R., 73, p. 725), heat production of rats on vitamin B (B_1)-deficient and vitamin B-supplemented diets was compared following the technic used in the previous study and making in addition, periodic analyses of the urine and feces to study the progressive changes in the utilization of energy and nitrogen during prolonged vitamin B deficiency.

The results confirm those reported previously by demonstrating a reduced production of heat in the vitamin B-deficient rats. In the rats receiving vitamin B supplement "a larger proportion of the ration was metabolizable, there was a more favorable body balance of energy, there was less energy and a lower proportion of carbon to nitrogen in the urine, and of the digested nitrogen a larger proportion was retained as body gain."

The present evaluation of vitamin B_1 therapy, M. G. VORHAUS (*Amer. Jour. Digest. Diseases and Nutr., 3 (1937), No. 12, pp. 915–920*).—The value of vitamin

B_1 as a therapeutic substance in clinical states such as neuritis, mild chorea, and carbohydrate, gastrointestinal, and metabolism disturbances, and in pregnancy is discussed. For the majority of cases, the author recommends the daily administration orally of from 1,000 to 2,000 Sherman-Chase units for a minimum period of 4 weeks, and, when required during pregnancy, for the entire period. It is stated that "the action of vitamin B_1 is the action of a catalyst that concerns itself with oxidation of the degradation products of glucolysis."

Combined ascorbic acid in plant tissues, B. H. Guha and J. C. Pal (*Nature [London], 139 (1937), No. 3524, pp. 843, 844*).—The authors present further evidence to support the view discussed in a paper previously noted (E. S. R., 77, p. 426) that plant tissues such as the cabbage contain some combined ascorbic acid which is released when alcoholic or ethereal extracts are heated in an atmosphere of nitrogen on a boiling water bath. An increase in the ascorbic acid content was noted when the extracts were heated after the addition of formaldehyde or mercuric acetate to remove interfering substances and when hydrogen sulfide was added in the hot condition. Chloroform extracts of dried cabbage, which gave negative results when titrated with indophenol, were positive after heating in aqueous solution, and upon subjection to the action of ascorbic acid oxidase approximately 75 percent of the reduction value disappeared.

Factors influencing the vitamin C content of vegetables, D. K. Tressler, G. L. Mack, and C. G. King (*Amer. Jour. Pub. Health, 26 (1936), No. 9, pp. 905–909, fig. 1*).—In continuation of previous studies (E. S. R., 76, p. 726) at the New York State Experiment Station, the authors investigated the influence of variety, freshness, and maturity and of the soil and growing conditions, storage, cooking, and preparation for freezing on the vitamin C content of spinach, rhubarb, peas, tomatoes, snap beans, and cabbage, using the Bessey and King modification (E. S. R., 71, p. 137) of the Tillmans titration method.

The preliminary data reported would indicate that variety is a factor of considerable importance as shown by the ascorbic acid values obtained for five of the six vegetables examined, with little difference being found between two varieties of rhubarb. The values obtained for spinach show that soil and growing conditions have a definite influence on the ascorbic acid content. While the fully ripe tomatoes had an ascorbic acid content nearly double that of green tomatoes, the content in peas decreased with maturity and for the other vegetables was approximately the same at all stages of maturity studied. Storage for 3 days at room temperature resulted in the loss of approximately one-half the content of vitamin C from freshly harvested spinach, snap beans, and peas, whereas after 3 days' storage at from 1° to 3° C. the vitamin C was practically all retained. The cooking tests revealed that a considerable proportion of the ascorbic acid passed into the cooking water, but the total amount was decreased only slightly. In the preparation of peas for freezing just sufficient blanching to inactivate the catalase resulted in the retention of most of the ascorbic acid content of the frozen vegetable at the storage temperature of from −18° to −9°. The vitamin C content of the frozen peas decreased slowly during the thawing process.

Vitamin C in vegetables.—VII, Lima beans, D. K. Tressler, G. L. Mack, R. R. Jenkins, and C. G. King (*Food Res., 2 (1937), No. 2, pp. 175–181*).—In continuation of a series of studies at the New York State Experiment Station, the authors followed the modification of the Tillmans titration method described in the preceding paper (E. S. R., 78, p. 154), and confirmed the results by biologi-

cal assay to determine the ascorbic acid content of eight varieties of lima beans grown on Ontario clay loam and graded according to sieve size. Data are also presented on the rate of loss of ascorbic acid during the storage of shelled lima beans kept in moisture-proof packages and of unshelled lima beans left in open containers at 0° and 22° C. and also during blanching periods of from 30 to 150 sec., following the usual process for preparing the vegetable for freezing, by determining the ascorbic acid content of the frozen lima beans cooked immediately and after 4 months' storage.

The following values are reported for the eight varieties of lima beans of the smallest size tested: The small-seeded pole type Willow Leaved 0.48 mg and the bush types Jackson Wonder 0.36 mg, McCrae 0.42, and Woods Prolific 0.41 mg, and the large-seeded pole types King of the Garden 0.61 and Challenger 0.6 mg, and the bush types Burpee 0.49 and Fordhook 0.46 mg of ascorbic acid per gram. The results show that the variety affects the ascorbic acid content and that in every variety the percentage of ascorbic acid decreased with the increasing size of the beans. Since the size is approximately related to the stage of maturity, it is evident that as the beans mature the percentage of ascorbic acid present decreases.

Refrigeration retarded the rate of loss of ascorbic acid during storage, with the shelled lima beans showing a loss of 29 percent after 4 days and 58 percent after 11 days of storage at 0° as compared to 19 and 31 percent, respectively, for the unshelled beans. The rate of loss was greater in the smaller sizes than in the larger sizes, but the original content of ascorbic acid was greater in the former and the amounts present after storage were approximately equal for all sizes of beans. The rate of loss of the ascorbic acid content of frozen lima beans increased as the period of blanching was increased. It is recommended that the commercial blanching period be 45 sec. for the smaller sizes and 60–75 sec. for the larger sizes to insure greater retention of vitamin C, flavor, and color, and inactivation of the catalase and peroxidase.

Distribution of vitamin C in the tissues of the gastrointestinal tract [trans. title], G. v. LUDÁNY and L. ZSELYONKA (*Biochem. Ztschr., 294 (1937), No. 1–2, pp. 108–111*).—The ascorbic acid content of the mucous membrane, submucosa, and muscle tissue of various sections of the gastrointestinal tract of dogs fasted for 36 hr. and anesthetized with chloralose was determined by the 2,6-dibromophenolindophenol titration method.

Throughout the entire tract the mucous membrane was richer in ascorbic acid than the other tissues, with a specially high concentration (38 mg percent) in the small intestines, the values decreasing in both directions. In the stomach the mucous membrane of the fundus contained more vitamin C than that of the pylorus. The muscle tissue also showed a higher concentration in the small intestines, about 10 mg percent, with decreasing values in both directions. The ascorbic acid content of the submucosa ranged from 10 to 15.6 mg percent.

The elimination of ascorbic acid (vitamin C) in normal urine in Rio de Janeiro [trans. title], G. G. VILLELA (*Compt. Rend. Soc. Biol. [Paris], 126 (1937), No. 29, pp. 609–612, fig. 1*).—Urinary excretion tests before and 3 and 24 hr. after intravenous injection of 100 mg of ascorbic acid are summarized for 60 adults in Rio de Janeiro selected as receiving a diet supposedly satisfactory but not exceptionally rich in vitamin C.

In general the ascorbic acid excretion of these subjects was below 15 mg a day, particularly among those of the poorer class whose food was habitually low in vitamin C. When the subjects were grouped by relative richness of their diet in vitamin C, the response to the test dose was much greater in those on the diet rich in vitamin C than the other group.

The inadequacy of synthetic ascorbic acid as an antiscorbutic agent, A. Elmby and E. Warburg (*Lancet [London], 1937, II, No. 24, pp. 1363–1365*).—In all but 3 of a total of 29 patients showing signs of hemorrhagic diathesis (as determined by the Göthlin capillary resistance test), together with low ascorbic acid concentration of the serum, the administration of 300 mg of ascorbic acid daily by mouth for 10 days led to disappearance of the tendency to hemorrhage and a return to normal values of the ascorbic acid in the serum. In the other three no change had taken place after a total of 3 g of ascorbic acid had been taken orally. The same amount of ascorbic acid was then given intravenously for 10 days but with no beneficial effects. However, after the juice of 10 lemons, furnishing from 200 to 400 mg of ascorbic acid, had been taken daily for 10 days the hemorrhagic condition disappeared and the serum ascorbic acid returned to normal. Detailed case reports for these 3 subjects showed a history of intestinal trouble over many years.

In explanation the authors suggest that some unknown substance (a co-vitamin) is required for the absorption and retention of ascorbic acid. "This unknown factor may either be part of some other foodstuff (in which case its absorption may be inhibited by certain intestinal diseases), or else it may be produced in the intestine under normal conditions. The hypothesis that this factor is the same as the P vitamin found by Szent-Györgyi is being investigated."

The influence of l-ascorbic acid on blood pressure [trans. title], M. Kasahara and R. Kawamura (*Klin. Wchnschr., 16 (1937), No. 44, p. 1543, figs. 3*).—The possible effect of intravenous injections of ascorbic acid on blood pressure was tested on guinea pigs, monkeys, and rabbits by recording the carotid pressure with a mercury manometer in narcotized animals. In guinea pigs the first signs of increased pressure were noted after injections of 100 mg per kilogram, when a very slight increase, from 4 to 7 mm of mercury, and lasting from 2 to 4 min. resulted. After an injection of 200 mg per kilogram, the increase in pressure amounted to about 10 mm of mercury and lasted for some little time. In monkeys the first increase occurred following a dose of 40 mg per kilogram. With a dose of from 100 to 200 mg per kilogram the increase amounted to from 10 to 18 mm of mercury over a period of from 10 to 15 min. In the rabbit, an animal which is considered to synthesize its own ascorbic acid, no increase in blood pressure could be detected after a dose of 100 mg per kilogram.

On the saturation of a scurvy patient with small doses of ascorbic acid.—Consideration of the daily human requirement, P. Schultzer (*Biochem. Jour., 31 (1937), No. 11, pp. 1934–1938*).—The urinary excretion of ascorbic acid in an elderly patient with scurvy of moderate severity was determined for a week before the administration of vitamin C and then for 4 weeks during which 40 mg of ascorbic acid was given daily by intravenous injection, following the same technic as in an earlier study (E. S. R., 71, p. 286). In the preliminary period on a vitamin C-free diet the average daily excretion of ascorbic acid was 11 mg. The same amount was excreted during the first week of treatment, with average daily values for the next 4 weeks of 16, 17, 26, and 28 mg. It was concluded that saturation, in the sense of constant output on constant dose, was reached in the fourth week, while the clinical cure of the scurvy occurred in about a week. Subsequent dosage by daily intravenous injections of 600 mg of ascorbic acid was followed immediately by a higher excretion, with saturation reached after 5 days.

These findings, together with previous findings of the author on other patients receiving ascorbic acid in much larger quantities, are thought to indicate that the quantity of ascorbic acid needed for saturation is not a measure of the

quantity required to satisfy the body's reserves and that saturation is not a criterion for the clinical treatment of scurvy. However, it is noted that these conclusions apply only when ascorbic acid is administered parenterally, and that when ascorbic acid is given by mouth there are other complications.

The vitamin B and vitamin C content of marine algae, E. R. NORRIS, M. K. SIMEON, and H. B. WILLIAMS (*Jour. Nutr., 13 (1937), No. 4, pp. 425–433*).—Seven algae were tested by animal bioassay for vitamin B (B_1) content and by the Bessey and King modification of the Tillmans method (E. S. R., 71, p. 137) for vitamin C content. Six of the samples contained from 2 to 5.5 Sherman units of vitamin B per gram, while one species contained only a trace. No relationship was found between the vitamin B content and the depth from which the algae were obtained. The vitamin C content varied from less than 0.01 to 0.6 mg per gram of wet weight, and seven of the samples compared favorably with lemon juice, containing from 0.31 to 0.57 mg. Generally algae collected from the littoral zone or on the surface were higher in vitamin C content than algae from a depth of 5–10 fathoms.

Seasonal variations in capillary resistance of institution children, L. J. ROBERTS, R. BLAIR, and M. BAILEY (*Jour. Ped., 11 (1937), No. 5, pp. 626–646, figs. 4*).—The capillary resistance of a group of 85 institution children was determined by the Dalldorf resistometer at five different periods during the year, and the results were studied in relation to the dietary supply of vitamin C, incidence of infections, and the availability of vitamin D from sunshine at different periods. The capillary resistance values revealed a distinct seasonal trend. The mean pressure of the group was low in February, still lower in April, higher in July, still higher in August, and low again in November. Of the individual records, 83 percent showed some tendency to follow this seasonal pattern, with decided correspondence in half, and almost perfect in 23 percent.

No relation was apparent between capillary resistance and incidence of infections, but there was a striking parallelism between the capillary resistance and the level of vitamin C and the theoretical amount of vitamin D, as determined from exposure to sunlight. In neither case, however, could the parallelism be interpreted as necessarily indicating a causal relationship.

Treatment of psoriasis with massive doses of crystalline vitamin D and irradiated ergosterol.—A preliminary report, E. T. CEDER and L. ZON (*Pub. Health Rpts. [U. S.], 52 (1937), No. 45, pp. 1580–1584*).—The results are given of a series of 15 cases of chronic widespread psoriasis treated by from 300,000 to 400,000 units of vitamin D from irradiated ergosterol in sesame oil prepared in capsule form. Within a maximum time of 12 weeks, 11 subjects obtained a complete involution of the chronic psoriatic process, 2 showed partial improvement, and 2 showed no benefit. Blood calcium determinations and urinalyses made weekly showed the progressive development of hypercalcemia in all but one subject. The massive doses of the vitamin D preparation used appeared to be relatively safe when administered to adults.

Nutritional dermatoses in rats, P. GYÖRGY, M. SULLIVAN, and H. T. KARSNER (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 313–315*).—The authors describe the symptoms of three different types of scaly dermatoses in rats due to deficiencies of vitamin H, which has been reported by the senior author to cure the nutritional disorder due to a high proportion of egg white in the diet, vitamin B_6, and lactoflavine.

Vitamin P, A. BENTSÁTH and A. SZENT-GYÖRGYI (*Nature [London], 140 (1937), No. 3540, p. 426*).—It is noted briefly that certain discrepancies in the test for vitamin P (E. S. R., 77, p. 740) have been cleared by the discovery that

"vitamin P requires for its activity the presence of traces of ascorbic acid. A scurvy diet frequently contains such traces, which in themselves have no influence on the development of scurvy but enable vitamin P to act. In the entire absence of ascorbic acid, vitamin P is inactive."

Disturbance of the cardiovascular system in nutritional deficiency, S. WEISS and R. W. WILKINS (*Jour. Amer. Med. Assoc., 109 (1937), No. 10, pp. 786–793*).—The nutritional factors responsible for abnormal function of the cardiovascular system are discussed in this paper. Among the vitamins, a deficiency of the vitamin B complex is shown to be the most important cause of cardiovascular disturbances, and when this condition exists in cases of scurvy and of rickets its occurrence is attributed to a coexisting vitamin B_1 deficiency.

On the identity of the Goldberger and Underhill types of canine blacktongue.—Secondary fuso-spirochetal infection in each, D. T. SMITH, E. L. PERSONS, and H. I. HARVEY (*Jour. Nutr., 14 (1937), No. 4, pp. 373–381, fig. 1*).—Data are presented to show that the Underhill syndrome (E. S. R., 59, p. 895) present in dogs maintained on a diet consisting of raw beef, cracker meal, cottonseed oil, yeast, and Underhill and Mendel salt mixture was prevented by the addition of sufficient cod-liver oil to supply 5,775 U. S. P. units of vitamin A and 577.5 units of vitamin D per kilogram of body weight per day, but not by the administration of 600 units of vitamin D in the form of viosterol, together with 1 mg of ascorbic acid per kilogram of body weight per day. The Goldberger type of canine blacktongue (E. S. R., 59, p. 476) present in dogs maintained on a diet consisting of yellow corn meal, coarsely ground California black-eyed peas (*Vigna sinensis*), casein, sucrose, cottonseed oil, cod-liver oil, and salt mixture was prevented by the addition of meat or yeast to the diet.

It is suggested that the presence of oral lesions in the dogs on both types of diets may be the result of infection with the fuso-spirochetal group of organisms secondary to lowered tissue resistance, since these organisms, which are normally present in the dog's mouth, were demonstrated in large numbers in the lesions. The clinical symptoms were identical in the dogs with each of the two types of dietary deficiency.

Relation of nicotinic acid and nicotinic acid amide to canine black tongue, C. A. ELVEHJEM, R. J. MADDEN, F. M. STRONG, and D. W. WOOLLEY (*Jour. Amer. Chem. Soc., 59 (1937), No. 9, pp. 1767, 1768*).—In a brief note the authors report that the administration of a commercial preparation of nicotinic acid to four dogs suffering from blacktongue, following the technic described by Koehn and Elvehjem (E. S. R., 78, p. 575), resulted in a cure in all cases. The crystals from the nicotinic acid amide isolated from highly active concentrates of liver showed high activity, and the distillate also proved very active in the cure of blacktongue. Recrystallization of the material as the hydrochloride gave a product with a melting point of from 227° to 228° [C.] uncorrected as compared to 230° for the synthetic nicotinic acid amide hydrochloride. "The fact that nicotinic acid amide is an essential ingredient of the diet is not surprising, since it is a component of certain coenzymes. However, the observation that a deficiency of this material may be the cause of blacktongue is most interesting."

Nicotinic acid and vitamin B_2, W. J. DANN (*Science, 86 (1937), No. 2244, pp. 616, 617*).—In a brief note the author confirms the above findings of Elvehjem and his coworkers that nicotinic acid prevents blacktongue and that flavine and vitamin B_6 are not identical with nicotinic acid.

Pellagra successfully treated with nicotinic acid: A case report, D. T. SMITH, J. M. RUFFIN, and S. G. SMITH (*Jour. Amer. Med. Assoc., 109 (1937), No. 25, pp. 2054, 2055, figs. 2*).—The administration alternately by intramuscular

and intravenous routes of 60 mg of nicotinic acid daily for 12 days to a patient who had endemic pellagra with anorexia, dermatitis, sebaceous gland changes, and dementia resulted in a striking improvement in the appetite within 24 hr., in the mental state after 48 hr., and in the appearance of the skin within 3 days. By the twelfth day of treatment the patient was entirely rational and all symptoms of the pellagra had disappeared. "If subsequent investigations prove that nicotinic acid is the P-P factor of Goldberger, it would seem that the problem of the prevention and cure of pellagra have been greatly simplified."

Pellagra in Egypt, P. Ellinger, A. Hassan, and M. M. Taha (*Lancet* [*London*], *1937, II, No. 13, pp. 755–758*).—This is a preliminary report based on the results of a clinical investigation of 204 inhabitants of Lower Egypt, 34 percent of whom were suffering from pellagra, 37 pellagrous and 32 nonpellagrous people living in Upper Egypt, and 9 pellagrous inmates of a mental hospital.

"Pellagra in Egypt appeared to result from two concomitant but independent factors: Malabsorption due to parasitic infection of the intestines and malnutrition due to a diet insufficient in the vitamin B_2 complex cause an increased formation, circulation, and excretion of porphyrins—i. e., a condition of latent pellagra. In such people the onset of active pellagra is precipitated by very hard physical work, especially in the open air, by intensive exposure to sunlight, or by febrile infectious diseases."

Pasteurized versus raw milk in undulant fever, J. I. Weisman (*New England Jour. Med., 216* (*1937*), *No. 22, pp. 977, 978*).—The inherent danger of undulant fever from raw milk is illustrated by an experience at a sanitarium for tuberculosis. In 1930 when raw milk was used in part, an examination of 243 patients and employees of the sanitarium revealed 38 individuals (15.2 percent) whose blood contained agglutinins to *Brucella abortus*. Ten of these had a titer of at least 1:80, considered to be a diagnosis of active or recovered undulant fever. Pasteurization of the entire milk supply was insisted upon, and in 1932 similar agglutinin tests on 312 individuals gave entirely negative results. Other sources of danger in raw milk as well as other sources of undulant fever infection are discussed briefly, and it is emphasized in conclusion that "pasteurization should become available to 100 percent of the population. All milk cows should be tested yearly for *B. abortus* infection and eliminated if found to be infected. Undulant fever is not a common disease, but it may be entirely eradicated if the proper steps are taken."

A case of pellagra successfully treated with a filtrate factor obtained from liver, S. Yudkin, J. C. Hawksley, and J. C. Drummond (*Lancet* [*London*], *1938, I, No. 5, pp. 253–255, figs. 2*).—A case is reported of a man with the characteristic symptoms of pellagra, previously existing on a poor diet, who failed to improve upon hospitalization with a milk diet supplemented by fish, eggs, and chicken. Within 3 days after the administration of 70 cc of the filtrate factor from liver twice daily (corresponding to about 500 g of fresh liver) as supplement to the diet, improvements in the condition of the tongue, skin, appetite, and mental condition were noted. At the end of 1 mo., exposure of the arms to the sun for 1 hr. did not bring out any ill effects. The filtrate factor was replaced by 1 dr. of a yeast extract, Yeastrel, three times a day, and the condition of the patient returned to a normal state.

A pectin-agar preparation in treatment of infantile diarrhea, G. Washburn (*Jour. Amer. Dietet. Assoc., 14* (*1938*), *No. 1, pp. 34–38*).—The use of a pectin-agar-dextri-maltose powder in the treatment of infantile diarrhea is shown to have certain advantages over the apple diet. The powder is heated with previously boiled milk in a double boiler for from 10 to 15 min., and the mixture

which is a smooth heavy liquid, is poured hot into a feeding bottle or cup. Vitamin concentrates, eggs, powdered milk, flavoring, and coloring may be added. A bibliography lists 24 references.

HOME MANAGEMENT AND EQUIPMENT

[Studies in home management by the Wisconsin Station] (*Wisconsin Sta. Bul. 439 (1937), pp. 24-26*).—Included in this progress report is a summary of a study by M. Cowles, G. Voigt, and F. Poynor on the clothing expenditures of 105 central Wisconsin families over a 1-yr. period.

MISCELLANEOUS

A memoir of AE—George William Russell, J. EGLINTON [W. K. MAGEE] (*London: Macmillan & Co., 1937, pp. VII+291, [pls. 4]*).—This is a story of a remarkable personality, George William Russell, better known by his pen name, AE, mystic, artist, poet who turned economist to aid his friend, Sir Horace Plunkett, to improve the cultural, social, and economic condition of the Irish people (especially the farmers), and was consulted by Secretary of Agriculture Henry A. Wallace with reference to farm policy and outlook in the United States. It is stated that the breadth of his interests and vision and the universality of his human sympathy stamp him as an outstanding man and benefactor of his race whom students of agriculture and rural life in their broader aspects can hardly afford not to know about.

[Forty-sixth and Forty-seventh Annual Reports of the Alabama Station, 1934–35 and 1936], M. J. FUNCHESS ET AL. (*Alabama Sta. Rpts., 1934–35, pp. 27, figs. 2; 1936, pp. 30, figs. 2*).—These reports cover, respectively, the 18-mo. period ended December 31, 1935, and the 12-mo. period ended December 31, 1936. The experimental work reported is for the most part referred to elsewhere in this issue.

Effect of agricultural and home economics research on Oregon's agricultural progress: [Biennial Report of Oregon Station, 1935–36], R. S. BESSE (*Oregon Sta. Bul. 350 (1937), pp. 85, figs. 28*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

What's new in farm science: Annual report of the director [Wisconsin Station, 1937], I, compiled by N. CLARK (*Wisconsin Sta. Bul. 439 (1937), pp. 96, figs. 18*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas Station.—A project has been begun at the cotton substation by the department of agronomy to find the relative incidence of metaxenia as it affects the determination of certain characters of the cotton fiber in cotton variety, genetics, and other tests. The department of plant pathology has organized a study on the effect of sulfur and fertilizers on the severity of stem rot of rice and on the relative resistance of several varieties. These departments jointly have organized a project at the rice substation to develop a variety of winter hardy oats resistant to crown rust, to determine the better varieties for central and southern Arkansas, to originate and test new strains for productiveness and winter hardiness, and to ascertain better cultural practices.

Kansas College and Station.—The cornerstone for the new $600,000 physical science building was laid April 20, and it is expected that the building will be ready for occupancy in about a year. It will house the departments of chemistry and physics and will provide facilities for the work of the station in these fields.

Rowland J. Clark, associate professor of milling industry and engaged in wheat and flour investigations, has resigned to accept a position in commercial work and was succeeded May 15 by Dr. R. K. Larmour, professor of chemistry in the University of Saskatchewan. Homer J. Henney, assistant professor of agricultural economics, resigned May 7 to accept a position with the U. S. D. A. Crop Insurance Service. Glenn S. Fox, instructor in agricultural economics, has resigned to accept a position with the Consumers Cooperative Association of North Kansas City, Mo., and has been succeeded by C. Peairs Wilson, an assistant county agent in the extension service.

Louisiana Station.—A piece of bottom land has been set aside for pasture paddocks for the department of veterinary science. A small barn has been built on this land for the department, as well as a feed-storage room and small feeding shed in each paddock.

Massachusetts College.—A chapter of Sigma Xi, national honorary scientific society, was installed April 14 with 39 charter members. The principal address was given by Dr. E. D. Merrill, director of the Arnold Arboretum of Harvard University, who spoke on the subject Origins of Cultivated Plants in Relation to the Origins of Civilizations.

Cornell University and Station.—The retirements are noted of two heads of departments of long connection with the institution. These are George W. Cavanaugh, professor of agricultural chemistry, after 43 years' service, and Dr. O. A. Johannsen, in entomology, after 36 years' service. Prof. Cavanaugh is continuing research on the relation of some of the rarer elements to nutrition. Dr. William I. Myers, formerly professor of farm finance and since 1933 Governor of the U. S. Farm Credit Administration, is returning to become head of the department of agricultural economics. Dr. Charles E. Palm, assistant professor of entomology and assistant entomologist, will become head of the department of entomology.

New York State Station.—Edwin N. Davis, agent in microbiology in a fruit products project of the U. S. D. A. Bureau of Chemistry and Soils, has been transferred to the position of assistant in research (chemistry) in the station

to engage in analytical work in the fertilizer and feed control laboratory. J. C. Hening, associate in research (dairying), has been granted 6 months' leave of absence beginning May 1 for study in the National Dairy Research Institute near Reading, England.

Association of Land-Grant Colleges and Universities.—The fifty-second annual convention of this association will be held in Chicago from November 14 to 16, 1938. Headquarters will be at the LaSalle Hotel.

New Journals.—*Journal of the American Society of Farm Managers and Rural Appraisers* is being issued semiannually by the society, of which H. C. M. Case of the Illinois University and Station is secretary. The primary objective is stated as "to give to our members and readers the latest and most authoritative information available on professional farm management and rural appraising." Among the articles in the initial number is one by W. E. Grimes of the Kansas College and Station on The Effect of Average Prices on Land Values (pp. 13–16).

Agricultura is being issued bimonthly by the Secretary of Agriculture and Public Works at San Jacinto, D. F., Mexico, primarily as a medium for the publication of current scientific and technical investigations. The initial number contains, in addition to announcements and abstracts, 16 articles dealing with biotechnical investigations, hydrology, agronomy, zootechny, health of animals, agricultural economics, colonization, and meteorology. Among these are Experiments in Fumigation, by A. Romero (pp. 2–7), and Chia, by J. M. Rulfo (pp. 28–37).

Australian Forestry, the journal of the Institute of Foresters of Australia, is being published semiannually at Perth, Western Australia. The initial number contains in addition to other material 11 original articles, among them Plant Nutrients and Pine Growth, by S. L. Kessell and T. N. Stoate (pp. 4–13); Higher Forestry Education in Australia (pp. 14–16); Forest Fire Weather Research in Western Australia, by W. R. Wallace (pp. 17–24); and Soil Science as a Factor in Modern Forestry Practice, by J. O'Donnell (pp. 61–66).

Current Titles From Engineering Journals is being issued monthly at 928 Broadway, New York City. The initial number consists primarily of tables of contents of about 125 current journals dealing with engineering, technology, geology, physics, and chemistry. Selected lists of Government publications of the United States and Great Britain and certain State publications are also given, including a number from the State experiment stations. A subject index accompanies the issue, and an annual cumulative index is projected.

Bacteriological Reviews is being published semiannually by the Society of American Bacteriologists at Mount Royal and Guilford Avenues, Baltimore, Md. The aim is "the publication of critical summaries and reviews of the various general and special aspects of the science." Each number will contain about 100 pages, the initial number being devoted exclusively to The Streptococci, by J. M. Sherman (pp. 3–97).

The Farmer's Digest is being published monthly by the School of Horticulture at Ambler, Pa. The initial number contains extracts from 28 articles selected from more than 200 publications from this country and abroad. Among them are Granulated Fertilizers Have Distinct Merit, by C. B. Sayre, from *Farm Research* of the New York State Experiment Station (pp. 19–22), and Does Pasture Fertilization Pay? by F. D. Gardner, from *Penn State Farmer* (pp. 57–59).

Farm Chemurgic Journal is being issued as a quarterly by the National Farm Chemurgic Council, Inc., of Dearborn, Mich. The initial number is devoted to the proceedings of the Third Dearborn Conference of May 25–27, 1937.

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